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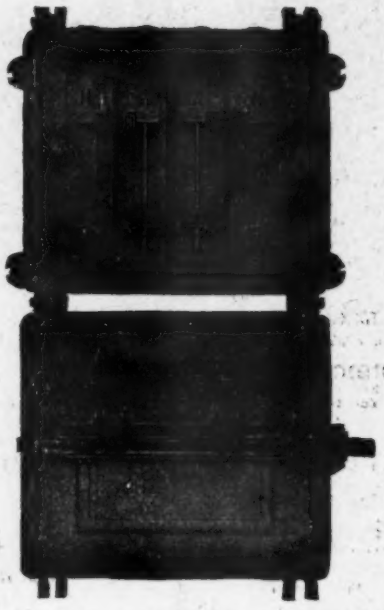

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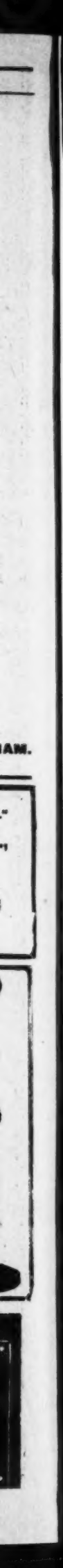

THE

# ELECTRICAL REVIEW.

VOL. LXXXVI. MARCH 12, 1920. No. 2,207.

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Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "London City and Midland Bank, Newgate Street Branch."

## DOMESTIC ELECTRICAL APPLIANCES: THEIR FORM AND FINISH.

THE Housing Exhibition in London has afforded the first opportunity for some time of reviewing progress in domestic electrification; the complete way in which every home use of electrical energy is covered, and the variety of means by which different makers secure the results, afford an eloquent testimony to the progress in technique which has taken place in recent years.

Electrically and mechanically most of the appliances put forward appear to have reached a high level of development, and although there is good ground for anticipating changes in detail, and even important variation in a few fundamentals of design, yet the immediate need seems rather for an attempt to link the apparatus more closely with the leading idea of its inception and the chief argument put forward for its use, namely, the saving of labour—direct within the home and indirect without it—by the reduction of waste and dirt, and the economy in labour which would follow from a cleaner air, and a longer useful life of buildings, decorations, and furnishings.

As everyone's expenditure ultimately becomes somebody's wages, so most economies in the end result in releasing labour for further production, and at present any method which decreases the cost of upkeep and maintenance and conserves capital values in business or in private life, is of the utmost use in re-establishing our much shaken economic position.

Devices and systems for saving labour or improving organisation must in themselves carry out the principle of unity and simplification towards which their use is aimed, but it is in the nature of things that their inventors are apt to be carried away by pride and pleasure in their own productions, and occasionally give to them elaborations not essential to their purpose, and capable even of discounting it; time and experience in use always prune away these exuberant growths, and leave only the essential and result-producing features.

In this connection the value of displaying electrical, or, in fact, any other appliances, in their working surroundings rather than in the showroom becomes evident; the maker can more easily realise that features upon which he had lavished attention may in practice detract from the utility of his products.

The great argument for domestic electrification to-day is that it reduces work by cutting out the chief source of dirt, and, in addition, assists in performing the reduced amount of work which remains.

One of the lesser, but important, divisions of household work lies in the cleaning and polishing of metals, a task of removing dirt which produces still more dirt in the process and also calls for a considerable amount of physical effort; we have already seen this problem attacked with great success by metallurgists, who have produced a rustless

alloy, rapidly being extended to replace all ordinary bright steel and iron goods in household use. So far we have not produced a white or yellow metal which is proof against the effects of air and moisture, but the increased use of lacquers, fired enamels, and other preservative coverings, and even the replacement of metal by porcelain and compositions are indicated as the correct practice.

It is here that the electrical manufacturer must guard against introducing a new series of appliances which need polishing, or are unduly difficult to clean. Ranges with bright parts, toasters, kettles, and plates in copper and nickel finish are very attractive, and have been in earlier days admired as much for their luxury and appearance as for their utility. At the present time a more practical spirit and a keener criticism are applied to all suggestions for home improvement, and the device seeking adoption as a work-saver must bring no fresh responsibilities with it.

Similarly with power-driven appliances, too much refinement of detail should be avoided if it entails any risk of failure, or the occasional need of skilled attention, which will probably not be forthcoming; faults which can be remedied in a few minutes by the makers of apparatus are sufficient to render it useless to the uninstructed user, and destroy her confidence in the electrical method generally.

It is impossible to say how greatly the use of electricity for cooking and similar work has been retarded by trifling faults of detail in plugs and connections and flimsy accessories, the cost of which might have been doubled without appreciable effect on the consumer's outlay.

The power-driven appliances in particular will call for a good deal of attention to features generally known as "fool-proof." The treatment they will receive in use is not likely to be gentle or directed by an appreciation of their limits, and it is most essential to allow for overloading, and to provide that framework and mechanical features shall be on the heavy side, whilst attention to water and dust proofing, and the simplest arrangement for lubrication with clear reminders of its necessity, should be features of every motor-driven device entrusted to the hands of the housewife or her servants.

Even in lighting it may not be amiss to bear in mind the need for simplicity, and the provision of fittings which will retain a high average efficiency with little attention; one of the principal points of superiority of electricity over gas is the lack of any need for frequent cleaning of shades or reflectors, and the maintenance of light at a high percentage of its original value throughout the life of the lamp. Some of the more modern fittings and glassware sacrifice certain of these advantages; in attempting too much elaboration, it is easy to create dust traps, and lose one of the advantages of electricity, the production of an artificial light ever ready without attention from the user.

Elsewhere in this issue we have again brought together particulars of a variety of appliances for use in the home, illustrating some of the many ways in which electricity can lighten labour and add to domestic comfort.

---

**Government Visits to Industrial Districts.**

We welcome the announcement which appears in our "Business Notes" to-day regarding the periodical visits of officials of the Department of Overseas Trade to industrial centres in this country. To our way of thinking, if this Department is to be a complete success, it is absolutely essential that its staff should be closely in touch with the manufacturers at home. In no other way can these gentlemen have an intelligent opinion regarding the capacity and ability of British works, or a sympathetic understanding of the why and wherefore of the attitude of industrial authorities towards particular aspects of export trade questions; nor can they, without a fairly close personal relationship, keep themselves sufficiently informed of the new British developments that are continually taking place. That the Department is in a position to furnish valuable information to traders seems to us to be proved already, but it will learn from practical experience how to increase the value of its service. In addition to the daily means of securing that experience through correspondence, the officials will now have the benefit of rubbing shoulders with men of industry in their own centres of activity. We hope that they will find the manufacturers and traders accessible, receptive, and communicative. What is there to be gained by adopting a policy of secrecy or aloofness? Let them carry their own co-operative principles into practice in their attitude toward a Government Department which is established expressly to assist them in legitimate ways.

We observe that Lord Burnham, in an address at the Crystal Palace Fair, has been laying stress upon another important side of the activities of the D.O.T.—the influence of its representatives in creating an atmosphere in the Overseas Dominions and among foreign communities abroad, favourable to the sale and consumption of British goods. As we have said repeatedly, these representatives stationed abroad will be better qualified to put the case for British trade effectively if they understand our manufacturing qualifications at first hand—that is, from previous personal study of our industries in the great centres where these are carried on. There is quite as great a need for these officials to know their subject completely as there is for home representatives to get into local industrial touch.

---

**Another Committee.**

It is reported in *The Times* that the Ministry of Transport is about to set up a Committee to investigate the electrification of main-line railways, and to report to the Ministry as to the practicability or otherwise of the schemes that have been proposed. In the meantime these schemes are, of course, held up. The most important is that of the North-Eastern Railway, between York and Newcastle, others being rather of the suburban or interurban type.

We fear the result will be serious delay in making a commencement with the work, as we remarked in a recent issue, probably for months. We know these Committees. The best Committee is a Committee of one, but that is not the kind we get. The new Ministry has certainly lost no time in falling into line with the revered traditions of the Civil Service, of which the first and oldest is: "Go slow."

---

**London Traffic.**

That the London railways, tramways, and omnibuses are all running at a loss is a matter of common knowledge; that such a condition of things cannot possibly be maintained is obvious, and the only question on which opinion is not unanimous seems to be that of finding a remedy. All the transport authorities are agreed as to the necessity of increasing the fares for that purpose; but, strangely enough, the public, whilst paying 130 per cent. more than it did five years ago for other commodities, appears to regard the raising of fares as an iniquitous proposition. It may be a psychological phenomenon; the traveller receives no material consideration for his money, and is apt to ignore the fact that he has purchased service. Yet when he visits the theatre or the picture-house, he willingly pays on a luxury scale for benefits which are equally unsubstantial.

But how else can transport undertakings be restored to a sound financial condition? To talk of economising, with the cost of coal, petrol, labour, and materials constantly

rising, and the rolling stock as steadily deteriorating, is idle. Even with the vehicles crowded to excess, the receipts do not balance the expenditure, and that with capital charges mainly on the pre-war basis of value; any new expenditure will necessarily be on a triple scale, and therefore will increase the difficulty of making ends meet. As a matter of fact, the fares, especially on the London tramways, before the war were absurdly too cheap—partly due to the competition of the omnibuses, which were indirectly subsidised by the maintenance of the roadways at the public cost, and by freedom from the burdens imposed upon the tramways, and partly due to political vote-catching.

The *Daily Telegraph*, whose attitude fairly represents the views of the Press, is astonished "that undertakings doing such enormous business are not more successful financially"; but it reports that the cost of carrying a passenger has increased 75 per cent., while the receipts per passenger have only increased 44 per cent.—where then is the occasion for surprise? Lord Ashfield refers to increases of 300 or 400 per cent. in the cost of materials and labour, "but against this we have to reckon that the number of passengers has increased by a third," says our contemporary, as if that could compensate for the other! It proceeds to declaim against the evils of competition, though admitting that in the "rush hours" "London needs every vehicle that can be run." If all are full, where is the competition? It is only during the slack times that competition can have an evil effect. The *Daily Telegraph* prescription to cure the malady is a Traffic Board for London, and that is certainly a crying need, as it has been these 10 years. We have consistently advocated the establishment of such a Board, but the politicians have blocked it up to now. It will have to come; but let there be no mistake about this fact—higher fares will have to come too.

If anything could be done to distribute the morning and evening traffic over wider periods, that would go a long way towards relieving the situation.

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**The Rating of Machinery.**

The fact that machinery in England and Wales is rated for local assessment under a series of statutes passed during the years 1862 to 1880, whereas in Scotland or Ireland, or indeed, as far as is known in any other country, it is not, has been a bone of contention among machinery users for many years. Even so, there is no uniformity in the methods of assessment, and the fact that some towns in the country offer preferential rating systems to manufacturers to settle in their areas has been one among other reasons why many important engineering firms have left London and other places less favoured in this connection. The main point, of course, is that whatever system of industrial taxation is in force should be uniform throughout the kingdom, so that one manufacturer may not be handicapped against his competitors with a different rating system from that which prevails in other districts. The Machinery Users' Association has been hammering away at the question since 1890, with a persistence which deserves a better fate than that which has hitherto befallen it; but the fact remains that we are still rated in respect of machinery under antiquated legislation, notwithstanding that in 1896 a Royal Commission reported in favour of a change. That, however, is merely cause and effect, for we do not know of a case in which the findings of a Royal Commission on an industrial matter have been acted upon. Consistently, every year from 1890 until 1906, the Machinery Users' Association have introduced a Bill, the main object of which has been to have a uniform system throughout the country whereby loose machinery is exempted from taxation. The record of these efforts is that time after time the second reading has been carried by a large majority in the House of Commons, but further progress has been blocked. The Royal Commission reported in 1901 in favour of the proposal of the Association. The only argument against the Bill all through has been that under it much machinery now assessed would escape taxation, and that the revenue of the local authorities would thereby be diminished. That result is contested, but it is interesting to point out, as illustrating our national mentality, that much of the mischief which has caused the attempts of the advocates of this reform to fail has been due to opposition on the part of the agricultural interests, who, until they themselves got relief of agricultural land from rating, consistently laid themselves out to "block" the Bill of machinery users in the House of Commons. That was in the days when landowners were in a far greater majority than they are to-day. Since then, the business element in the House has increased enormously. In 1908, action by the Association was stayed on the promise of a new Valuation Bill by the Government, which never eventuated, and nothing further has been done. The new conditions created since the war, however, with the shorter hours and lessened productivity of machinery, have influenced the Machinery Users' Association again to bring forward its Bill, which is a measure consisting only of three clauses, providing that only "machinery, machines, or plant" for the purpose of "producing or transmitting first motive power for heating or lighting" shall be assessable, and that all loose machinery or tools, *i.e.*, those which are only so fixed that they can be removed from their place without necessitating the removal of any part of the premises, should be exempt. That is in the terms of the Royal Commission's report in 1901, but the present conditions are such that the Government can find only too ready to hand excuses for not giving facilities for such a private Bill, or for not taking up the question itself, yet it is a matter of considerable importance to the industrial community. With the much larger number of business men that there now are in the House of Commons, who themselves have a direct interest in the problem, there may be more hope than there has been hitherto, that some pressure will be brought to bear which will assist the passage of the Bill. Another factor also may possibly be that the disappearance of the old Local Government Board, which on this question always seemed to favour the line of least resistance, and its replacement by the Ministry of Health, may have the result of bringing more modern ideas into play. The drawback hitherto has been that the whole enunciation of the law of rating has drifted into the hands of lawyers and generations of Government officials who have faithfully carried on the old traditions. It is high time the business man's point of view came a little more into prominence as a corrective to the perpetuation of ideas which can no longer find a place in modern industry.

---

**German Breaches of Contract.**

The number of cases is gradually increasing in which foreign customers complain of the refusal of German firms to execute orders at the pre-arranged prices, this being especially so in Holland and the Scandinavian countries. After the unfortunate purchasers have been informed that the contract prices have been raised by 100 or 200 per cent. to meet the increased cost of wages and materials, they receive intimation later on, when inquiring about the expected delivery, that the Government will not give an export permit unless the quotations are further advanced by some hundreds per cent. in marks. Thus, after the German makers have forced up the prices as far as they deem it advisable to do directly on their own account, they make a further increase on the pretext that the responsibility for the fresh augmentation rests with the Government. A short time ago we drew attention to cases of this kind which arose in Denmark in the matter of electrical apparatus, but the most glaring instance has just been disclosed by Mr. L. J. Vogt at a meeting of the Christiania Chamber of Commerce, held a fortnight ago. The speaker stated that great losses had occurred in Norway through German breaches of contract. In one single case the question concerned the delivery of electrical machinery of the contract value of 3,000,000 kronor. The contract contained all possible reservations that the results of labour disputes, &c., should not prejudice the purchasers, but notwithstanding this fact the German firm subsequently demanded the payment of 18,000,000 kronor, an increase of 500 per cent. It is quite obvious that cases of this kind will not tend to improve the reputation in other countries of either German electrical firms or other manufacturers who are following the same practice.

# EXTENSIONS AT DARLINGTON.

A description of the plant recently installed at the Darlington Corporation electricity works is of more than ordinary interest on account of the exceptionally low working costs obtained at these works. Although there is no natural supply of condensing water at the Darlington works, and coal has to be brought a distance of from 15 to 20 miles, and the load factor is only 25·6 per cent., the cost of fuel per unit sold is the lowest recorded this year for any undertaking in this country. Darlington also has the lowest total working costs per unit sold for any undertaking with equal or lower output, and the third lowest for any output, the two undertakings with lower costs having very much larger outputs and higher load factors.

The latest installation of boiler plant will consist of four Babcock & Wilcox boilers placed in pairs on each side of a chimney stack, a Green economiser with 384 11 ft. 6 in. tubes being set across the back of each pair of boilers. The gases from the two boilers pass into a flue under the economiser, and dampers are arranged so that these gases can be passed through the economiser or directly to the chimney. An induced-draught fan is fixed on a concrete platform above each economiser, and a horizontal damper is placed across the chimney shaft between the inlets and outlets of the fans. The inside diameter of the chimney shaft (10 ft.) was made unusually large for the output of the boilers, in order to prevent the emission of grits when small low-grade fuel is used, and the nuisance which existed from this cause before the chimney was erected has been effectually dispelled. The normal rating of each boiler is 25,000 lb. of steam per hour from, and at, 212° F. They are constructed for a working pressure of 200 lb. per sq. in. and a temperature of 650° F., but owing to other boiler and generating plant still in use, the working pressure at present is 160 lb. per sq. in., and the temperature is 550° F.

Two steam-turbo feed pumps by Messrs. G. & J. Weir, Ltd., each capable of an output of 7,000 gallons per hour, are placed on a raised platform between the two pairs of boilers and in front of the chimney. On the same platform are placed a Lea recorder capable of measuring the water for the four boilers, and duplicate motors for driving the stokers. This platform is raised 7 ft. 6 in. above the boiler-house floor level, in order to give free access to the boiler inspection and cleaning doors.

The four boilers, with economisers, chimney, induced-draught plant, feed pumps, Lea recorder, stoker motors, &c., form a complete unit, which can be repeated for future extensions, or, if desired, a different arrangement can be adopted for the next installation of boilers, without detriment to the existing plant.

Two of the boilers are fitted with chain-grate stokers working under induced draught only, but the stokers for the other two boilers, which are not yet erected, will be of a new type now being introduced by Messrs. Babcock and Wilcox, Ltd., and they will work with both forced and induced draught. The forced draught for these stokers will be furnished by fans located in the basement, one under each stoker, which will deliver into a common air duct of comparatively large area, also under the stokers; this arrangement will reduce the length of the duct between the fan and the stokers to an almost negligible quantity so far as loss of air pressure is concerned. It will also enable two boilers to be operated by one fan in case of breakdown, or under light load conditions. At present coke breeze and other low-grade fuel is being burnt, together with coal, on the sandwich system, but with the new stokers it is anticipated that low-grade fuel will be burnt without the addition of freshly-wrought coal.

The coal and other fuel is delivered in bottom-door trucks on a railway siding running through the boiler house at a height of 8 ft. 6 in. above the firing-floor level, and is dropped from the trucks into a receiving hopper, opposite the new chimney, from which it is fed into a Babcock and Wilcox gravity bucket conveyor by means of a rotary filler. Above the fronts of the boilers is a ferro-concrete coal bunker

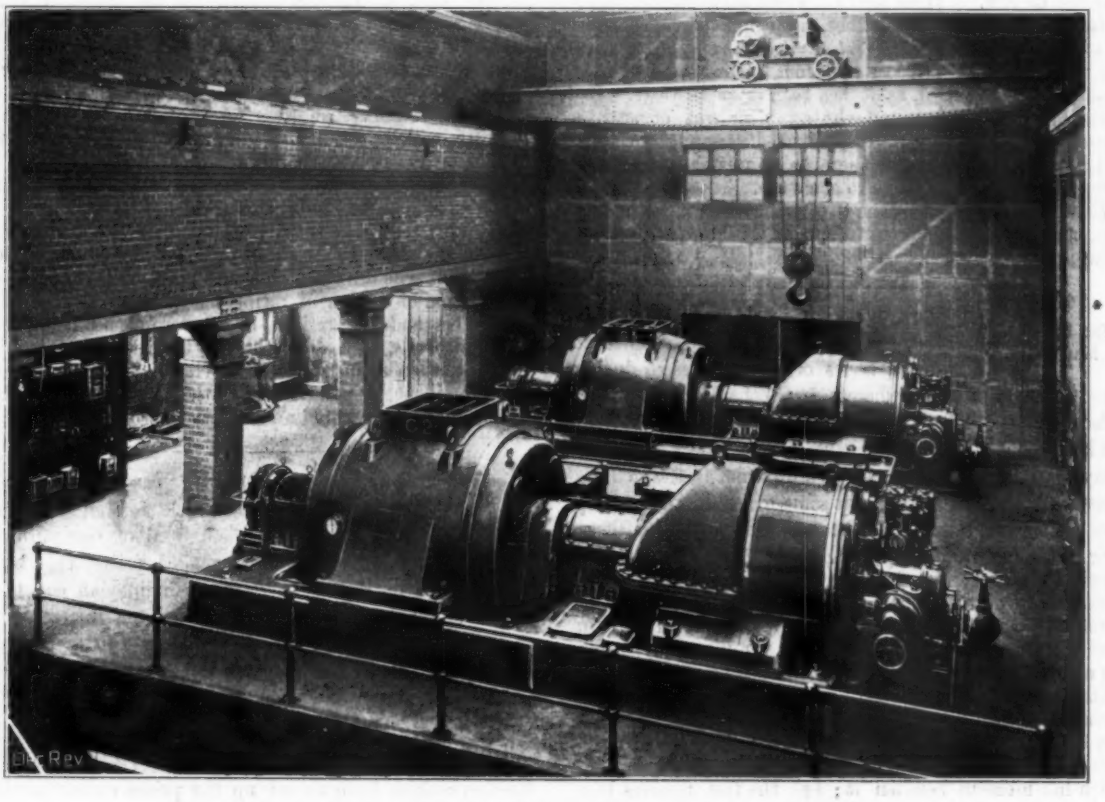
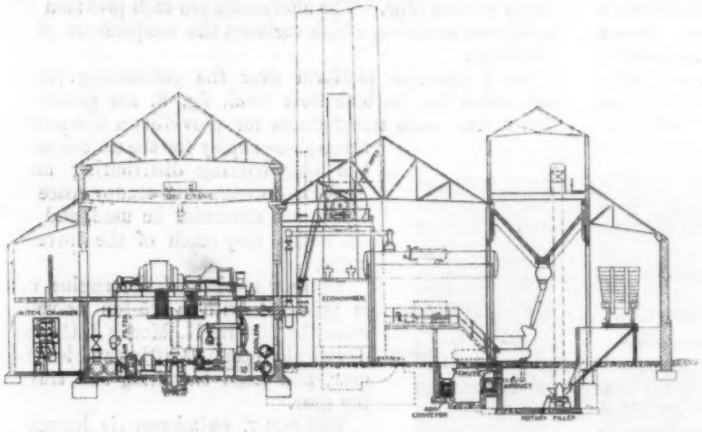


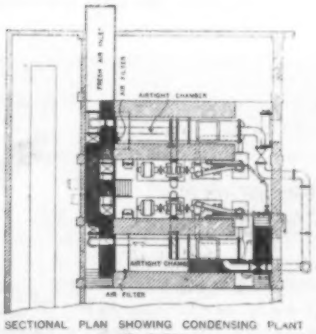
Fig. 1.—Fraser & Chalmers-Siemens 3,000-kw. Turbo-alternators at Darlington.

with a capacity of 50 tons of coal per boiler, and the fuel is delivered into this bunker by the conveyor. In addition to the chutes feeding the boilers immediately beneath the bunkers, each bunker has an auxiliary outlet valve which delivers fuel, when required, into a 10-cwt. travelling hopper, which runs on an overhead rail; this hopper is used for feeding the older Lancashire boilers, which are not provided with overhead bunkers, and which are mainly used for peak-load work. The boiler-house siding is shortly to be provided with a 15-ft. weigh-bridge, and a capstan to enable the trucks to be handled more expeditiously.

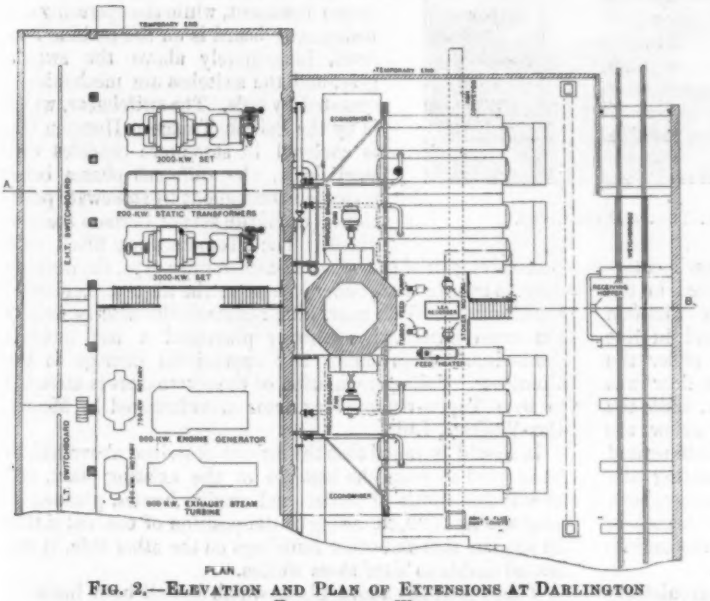
A new type of ash-conveyor, made by the Underfeed Stoker Co., is being installed under the boilers. The ashes drop continuously from the backs of the grates into this conveyor, which delivers them into a receiving-hopper, from which they can be dropped into wagons without any manual labour whatever. The conveyor is of the scraper type, running in a cast-iron trough filled with water, which performs the double purpose of quenching the ashes and sealing the ash chutes, from the grates to the conveyor, against leakage of air into the boiler. Corrosive action of the acid formed by the ashes and the water is prevented by continually renewing the water in the trough, a small stream of water entering at one end and overflowing at the other. Where the ash-conveyor emerges from the boiler house it carries the ashes up an inclined trough to a point above the ash-receiving hopper, and drops them into the latter. The speed of the conveyor is from 10 to 20 ft. per minute, and the power required amounts to less than 0·5 H.P. per boiler. Chutes are formed in the floor between the boilers and immediately above the ash-conveyor, so that all dust &c. removed from the boilers and flues can be raked into the conveyor. The induced-draught fans are of the low-speed type, by Messrs. Musgrave and Co., and are operated by pipe-ventilated, variable-speed motors, which enables the draught to be regulated without waste of power. The economisers are each fitted with a circulator, working on the injector principle, by the National Boiler and General Insurance Co. These circulators cause some of the hot water from the outlets of the economisers to mix with the water entering the economisers, and ensure that the temperature of the water is never low enough to cause corrosion of the end tubes by condensation of the water vapour in the flue gases. The exhaust steam from the feed pumps passes into a tubular feed heater through which the feed water is pumped to the economisers. A water softener by the Patterson Engineering Co. is used to soften the make-up feed water. The boilers are fitted with soot-cleaning apparatus, by the Boiler Tube & Flue Cleaner Co., Ltd., by means of which the soot and dust can easily be blown from the boiler tubes whilst the boilers are at work. One of the boilers has recently been fitted with an indicating $CO_2$ meter by W. R. Patents, Ltd., and similar instruments will probably be fitted to the new boilers, which will also be equipped with steam-flow meters and triple draught gauges.



SECTIONAL ELEVATION A B.



SECTIONAL PLAN SHOWING CONDENSING PLANT AIR FILTER &c.




PLAN.

FIG. 2.—ELEVATION AND PLAN OF EXTENSIONS AT DARLINGTON ELECTRICITY WORKS.

The usual temperature of the condensate from the condensers is 97° F., and this is raised to 127° F. in the feed-pump exhaust heater and to 238° F. in the economiser. The temperature of the gases leaving the boiler is 500° F., and leaving the economiser it is 295° F. Under ordinary full-load running conditions the amount of steam raised per lb. of coal burnt is equivalent to an over-all efficiency of boiler, economiser, feed heater, &c., from water at 60° F., of 85 per cent.

A small, but well-equipped, coal-testing laboratory has been fitted up at one end of the boiler house, and all coal received is tested for calorific value, &c., in the following manner:—A conical bucket, wider at the bottom than at the top, is placed in a suitable position under each truck of the fuel, so as to catch a sample of the fuel as it falls into the receiving hopper, and as the opening at the top of the bucket is smaller than the average diameter, it fills gradually as the truck empties, and receives a fairly average sample. The contents of the bucket, which weigh about 20 lb., are then fed into a Sturtevant crusher and sampler, which is driven from the stoker shafting, and this machine crushes the fuel to about $\frac{1}{2}$ in., and retains a 5 per cent. sample of the fuel fed into it. This sample is placed in an airtight tin, and when a sufficient number of tins of one class of fuel have been collected, their contents are fed into

the sampling machine again, and a 5 per cent. sample of these contents is obtained, and is sent to the laboratory to be tested. In this way an average sample weighing from 0·5 lb. to 1 lb. is collected from each 10 to 20 trucks, according to the quantity of each class of fuel received, and an accurate record of the average calorific value is obtained with a minimum of labour. Samples of coal taken by the Sturtevant machines have been checked by an expert in the art of coal sampling, the machine sample being compared with a sample taken by quartering in the usual way, and almost identical results were obtained when the samples were tested.

The main steam range consists of a single 10-in. pipe running parallel to the wall between the engine room and boiler house, and fitted with sectionalising valves at suitable intervals, and all branch pipes to the boilers and turbines have their valves close to the main range, so as to reduce to a minimum the risk of a pipe failure affecting the main range. The boilers are not provided with any other valves than those close to the range, but the turbines have the usual starting valves on the machines. Steam traps of the bucket type, by Messrs. Alley & MacLellan, are used to keep the steam pipes clear of water, and where the failure of a trap might cause serious trouble by the accumulation of water, the traps are arranged in duplicate.

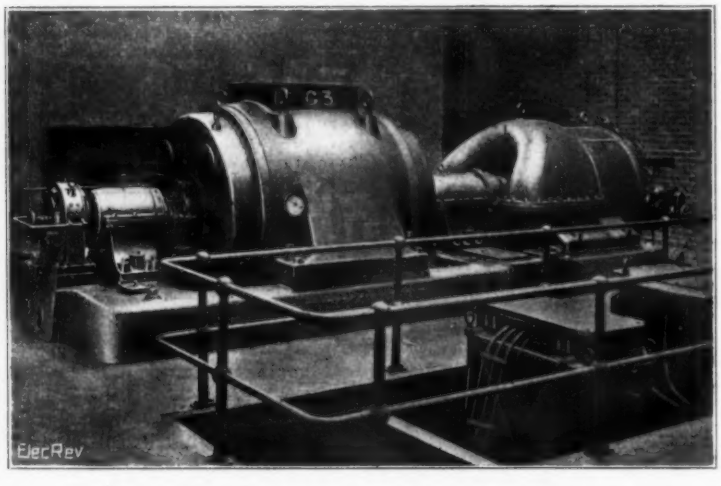



Fig. 3.—Generator End of 3,000-kw. Turbo-Alternator.

Two 3,000-kw. Fraser & Chalmers-Siemens turbo-alternators, figs. 1 and 3, have recently been installed in the engine room; they exhaust into Worthington Simpson rectangular surface condensers placed below and in line with the turbines. In order to provide room under the turbines for the condensing plant, the turbine floor was raised 9 ft. 6 in. above the old engine-room floor, while the condenser basement was dropped 5 ft. 6 in. below the engine room. There are no valves between the turbines and the condensers, but provision is made for flooding the condensers when the turbines are exhausting to atmosphere. In order that the condenser tubes may easily be cleaned or withdrawn, a large door has been formed in the engine-room wall opposite to the end of each condenser.

The condensing pumps, which include a circulating-water pump, an air-extraction operating pump, and a condensate pump, are all mounted on one shaft, and driven by a 110-b.h.p. squirrel-cage motor running at 1,460 r.p.m. Both sets of pumps are placed in the basement between the two turbo-generators, which makes a very compact and neat arrangement, and reduces the average distance between the turbo-alternator centres to 16 ft. 6 in.

Part of the water required to make up for the evaporation from the cooling towers is fed through the oil cooler and the air extraction pump, as this water, which is taken from the supply mains, is much colder than the condensing water from the cooling towers. The space underneath the alternator is formed into an air chamber, bounded on three sides by the longitudinal concrete foundation blocks and the condenser end, and on the fourth side by a Heenan & Froude rotary air filter placed across the space between the ends of the foundation blocks. The air inlet to the alternator which opens into this air chamber is provided with a damper, which can be closed by a lever on the turbine floor in the event of the alternator firing. Between the ends of the alternator foundations and the wall of the switch-chamber a passage, 5 ft. 3 in. by 14 ft. 6 in., is formed, along which fresh air is drawn to the air filters from outside; and the main condensing water-pipes are laid along the floor of this passage.

The turbines, which are of the Rateau impulse type, run at 3,000 r.p.m., the periodicity of the supply being 50 and the pressure 6,600 volts. Each turbine is provided with an automatic turbine-driven auxiliary oil pump for starting and emergency work. The turbines are fitted with B.T.H. indicating steam-flow meters, which can be checked at any time by the Lea recorder in the boiler house. To enable this to be done valves are provided, so that all but the condensate from one turbine can be turned direct into the feed pump suction pipe. The alternators are each provided with a dial thermometer, which registers the temperature of the windings.

On a concrete platform over the condensing pumps, but below the turbine floor level, fig. 3, are placed two 200-k.v.a. static transformers for providing a low-pressure three-phase supply for the station motors and neighbouring distributing mains. The transformers thus occupy space that would not otherwise be used, and they are within easy reach of the travelling crane.

The new section of the engine room is provided with a 25-ton travelling crane by Messrs. H. Morris & Co., with electrically-operated lifting and lowering gear, and hand travelling and traversing gear.

The e.h.t. switchgear is housed in a chamber running alongside the condenser basement, while the operating and instrument board is on the turbine floor level, immediately above the switchgear, and the switches are mechanically operated by rods. The switchgear, which is by the British Thomson-Houston Co., is enclosed in stoneware cubicles with steel doors, the different phases being separated throughout by stoneware partitions; duplicate sets of busbars are provided. The alternators are fitted with protective gear of the balanced-transformer type, the neutral-current transformers being located in the air chamber under the alternator. This gear, which controls the field as well as the main switch, has already prevented a bad internal short-circuit from doing any appreciable damage to the alternator. Voltage regulation of the alternators is attended to by a Taylor-Scotson regulator manufactured by Messrs. Cox-Walkers, Ltd.

It should be noted that the lay-out described above had to be adapted to make the best use of the existing plant, and to suit the width of boiler and engine houses, planned as long ago as 1899, as, owing to the position of the coal siding on the one side and other buildings on the other side, it was not advisable to alter these widths.

The cost of the above plant, which has all been installed since 1914, and a considerable proportion of which is being installed at the present time, excluding coolers, feeder switchgear, rotaries, &c., but including buildings and travelling crane, amounts to about £10 10s. per kw. of normal full-load continuous rating.

In conclusion, we must express our indebtedness to Mr. J. R. P. Lunn, borough electrical engineer, who is solely responsible for the lay-out and installation of the plant described, for the details and photographs set out above. Whilst congratulating him on the excellent results obtained from his plant, we may draw attention to the fact that in order to attain those results he has adopted the scientific principle of measurement throughout the installation, of which on previous occasions we have emphasised the importance. Only by such methods can the highest efficiency be secured and maintained.

# ELECTRICITY IN THE HOME.

In our issue dated June 20th last an article appeared under the title of "Domestic Electrical Appliances," in which details were given of a number of labour-saving electrical devices, which, in view of the difficulties of the domestic servant problem, would considerably lighten the housewife's burden. The need for aid in this direction has not decreased, and we therefore deem it desirable to describe several more of these appliances. As in the previous instance, the majority of these are of American manufacture, but it is hoped that in their schemes of reconstruction and progress British electrical manufacturers will not overlook the growing importance of the application of electricity to domestic needs.

The electric washing machine occupies the premier position as a labour saver, doubtless because of the drudgery entailed by the usual process. The "Geyser," fig. 1, sold by Messrs. L. G. Hawkins & Co., London, is a good example of its kind, and is being extensively advertised in this country. Made in three sizes, its main feature is a revolving, perforated zinc cylinder in a tank of galvanised steel. Entering this tank is a small motor-driven propeller, fig. 3, by means of which the cylinder is kept in rotation and the hot suds are forced through the cylinder and the clothes. The water is drawn back again through the clothes by suction, thus giving them a second treatment. When this process is completed the perforated cylinder can be raised and locked in its new position to enable the clothes to be put through a wringer. The latter, which is driven by the same motor, is provided with means for starting, stopping, or reversing, and also a quick release in case of accidents. The motor, fig. 3, employed for driving the gear is a ¼-h.p., 1,750-r.p.m. machine, and consumes a quarter of a unit per hour, and the machine makes no more noise in working than an electric fan.

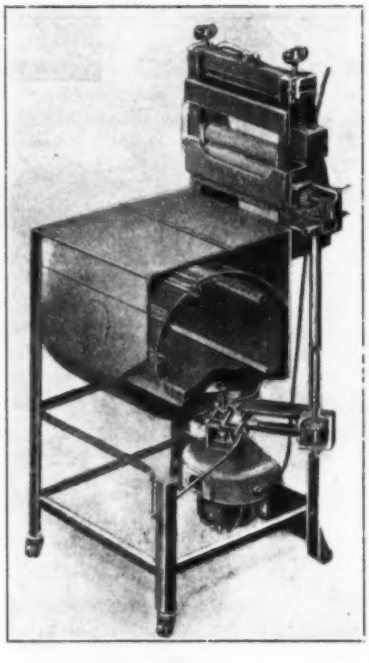


Fig. 1.

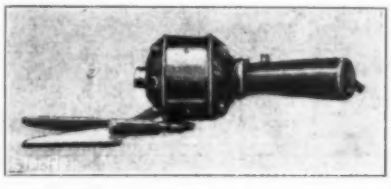


Fig. 2.

Fig. 3.

Many interesting features are possessed by the new Hughes automatic electrical range, made by the Hughes Division of the Edison Electric Appliance Co., of Chicago. In this range, fig. 4, both time and temperature for cooking are automatically controlled. The time-controller can be set to switch the current on and off over any period desired. The temperature regulator consists of a thermostatic device which permits the temperature to rise to the desired height and then switches the current off until the temperature falls, when it again closes the circuit. This is continued until the time-controller cuts the current off. In this way not only is waste of energy eliminated, but the adjustment of temperature prevents the food burning. The two devices are quite independent, and it is possible to use them either separately or in conjunction as described.

An outfit which will prove very serviceable in farmhouses or country homes is the electrical churning set, fig. 5, made by The Robbins & Myers Co., Springfield, Ohio. It consists of a small ¼-h.p. motor fixed upon a steel tripod. The driving pulley is connected by a belt to the churn gear, which is supported by steel rods fixed in a solid base. The power is transmitted to the churning blades by means of direction-changing gears.

Another appliance which may prove of great use in the home is a pair of electrically operated shears, fig. 2, put on the market by the Sperry Gyroscope Co., of Brooklyn, N.Y. These are driven by a small motor making 9,000 r.p.m., to the cover of which the lower blade of the shears is rigidly fixed. The upper blade is connected by a link and eccentric to the motor shaft, which imparts an oscillating motion at the same frequency as its own. So rapid is this oscillation that it is said that each individual fibre of the material is severed. Although these shears will cut anything from silk to asbestos, perfect safety is ensured to the operator, as the actual movement of the blades is only about 1/16th of an inch.

The electric suction-cleaner considerably lessens the labour involved in keeping the home clean, and an appliance that possesses many valuable points as the "Hoover" sweeper, produced by the Hoover Suction Sweeper Co., London. While the usual type of cleaner depends solely upon the suction principle for its effectiveness, this machine, fig. 6, also beats and sweeps, and is therefore useful in many ways. The motor supplying the driving power is fixed on the top of the sweeping portion, and is enclosed in a metal case. In the sweeper is a small shaft upon which are mounted at intervals, and at different angles, small brushes. This shaft, which is belt-driven from the motor, rotates the brushes at a very high speed, and these, besides sweeping, cause a fluttering movement of the air which is drawn through the material being cleaned and set up a sharp beating motion, separating the dust from the fibres and sucking it into the cleaner. The dust receptacle is fixed under the handle of the machine. The cleaning attachment consists of a small enclosed exhauster coupled direct to the motor shaft, acting upon the sweeper-chamber and also through a flexible tube upon the mouth of the suction cleaner. It is claimed for the "Hoover" that it costs only 1d. per hour to run it from a lighting circuit.

Fig. 4.

Fig. 5.

The "Overseas" vacuum cleaner embodies many new ideas, its outstanding feature being the "air-way" handle. This obviates the use of a tube attachment, as suction is employed through the handle itself. The whole appliance weighs only 7 lb., and therefore the end of the suction handle can be applied without much trouble. The sweeper, fig. 7, which

runs on side rollers, possesses a swivel joint enabling it to be easily steered into corners and under furniture. The motor case has a transparent cover which affords an indication of the completion of cleaning. The dust drawn into the collector is retained by a paper container which, when filled, is taken out bodily and burnt. This container permits a faster escapement of used air, and keeps back the finer dust which a cloth container would allow to pass. The machine is made by the Overseas Engineering Co., Ltd., London.

Another method of cleaning carpets is provided by the Hamilton Beach Manufacturing Co., of Racine, Wisconsin, U.S.A., in a machine, fig. 8, recently introduced. This does not merely sweep carpets, but actually washes them while they remain in position. A specially prepared, soapy compound, supplied by the makers of the cleaner, is poured into an aluminium container, where it is electrically heated. It

politan Asylums Board proposes to install electric sewing machines in its institutions, calculating that the output by this means will be at least 50 per cent. greater with diminished fatigue to the workers.

A great deal of time can be saved, and no doubt a great deal of annoyance as well, by the adoption of electrical means for drying ladies' hair. The hair-dryer, fig. 14, consists of a very small and light motor having a fan fitted to its shaft. The air from the fan is forced through electric heating coils, and is thereby warmed and dried at the same time.

Many and varied are the uses to which the heating effect of the electric current is put, and it may be as well to mention one or two. Of course, the electric iron occupies the premier position in this connection, but it is unnecessary to describe what is, perhaps, the only domestic electrical appliance used in this country to any great extent. Simplex Con-

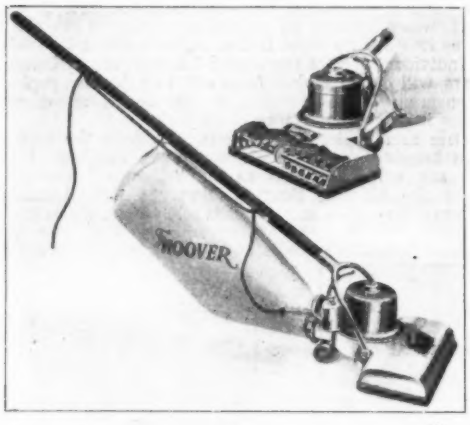



Fig. 6.

Fig. 7.

Fig. 8.

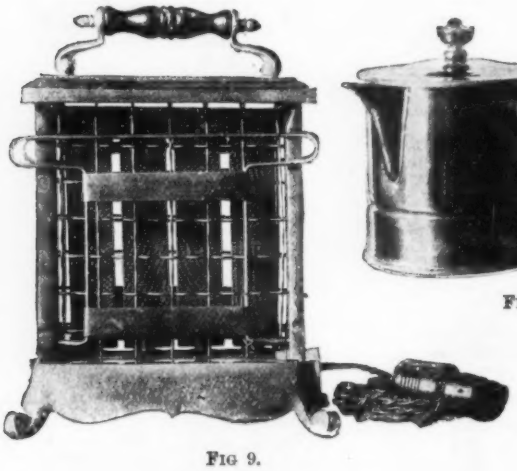


Fig 9.

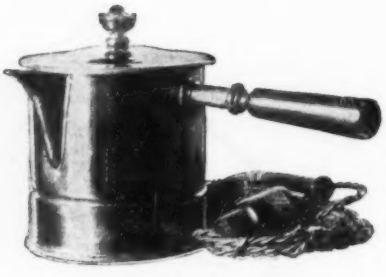


Fig. 10.

Fig. 11.

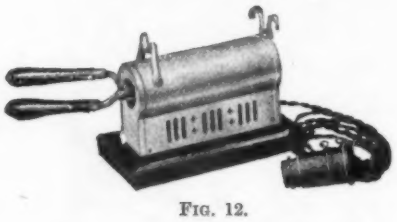


Fig. 12.

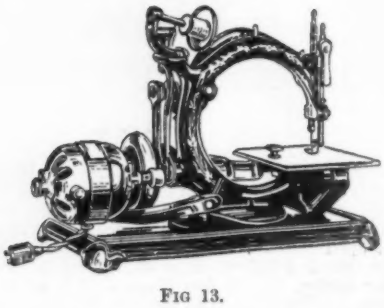


Fig 13.

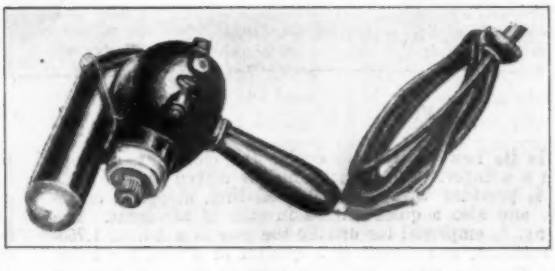


Fig. 14.

is then allowed to flow down to two soft rubber brushes which oscillate at the rate of 500 times a minute. The motion of the brushes is the same as that of the human hand when scrubbing. The compound is thoroughly scrubbed into the fabric and then drawn back into a receptacle, bringing with it all the dirt and grit from the material being operated upon.

The fatigue entailed in the use of the foot- or hand-operated sewing machine may be eliminated by the introduction of a machine driven by an electric motor. The latter is usually coupled directly to the sewing machine transmission shaft as in the Western Electric type, or drives by friction as in fig. 13. The motor leads are connected to a pedal switch, leaving both hands free for manipulating the work.

In this connection it is interesting to note that the Metro-

duits, Ltd., of Birmingham, manufacture a variety of small appliances of this nature, chiefly designed to localise the heat to a certain extent. An electric foot-warmer is one example. This is a box containing the heating element, covered with carpet and of a convenient shape and size for use as a foot-stool. Fig. 12 shows a curling tongs heater, and other articles are shaving cups, fig. 11, kettles and saucepans, fig. 10, all of which quickly boil water and are of great utility in bedrooms, &c., where small quantities of hot water are required.

"Breakfast table" appliances have become extremely popular, due mainly to their usefulness and convenience. Unfortunately it sometimes proves very inconvenient to have flexible leads to these from an overhead bracket, and it has, therefore, been suggested that an electrical sideboard would

be a great improvement. On this sideboard would be a row of plug-sockets plugs to which the grills, toasters, fig. 9, &c., could be connected, and in this way the appliances would still be conveniently near, and the danger of catching up a wire with disastrous effect would be avoided.

Apart from devices specially designed for operation by electricity, a good many of the existing domestic apparatus can be adapted to enable them to be driven by a small electric motor, such as sewing machines and wringers, and also—turning to the musical side—gramophones or piano-players.

There is no doubt that the chief obstacle in the way of those who would otherwise be glad to avail themselves of the great help afforded by electricity is the initial expense, but when the resultant saving, both in labour and money, spread over the life of electrical appliances, is taken into account, as well as the absolute cleanliness of electrical methods, the use of electrical aids is unquestionably well worth while.

## THE SALARY OF A TECHNICAL ENGINEER.

By "RUDDIGORE."

The other night I dreamt a wonderful dream. I was back in the High Street of my native village, basking again in its romantic quaintness, when someone tapped me on the shoulder. It was Peter, my old chum, returned from the wars.

"Wonders never cease!" he cried. "Millionaires in Villagehampton? Well!"

"Who's the millionaire?" I asked simply.

"Why, you, of course. An *engineer*—a man who's been on munitions for years."

"Alas, I am an engineer," I replied, "and, as you say, Fate kept me for years with what was called a controlled establishment. But you forget. I am only a *technical* engineer, who is ever poor. Had I been one of the 'amalgamated' type, skilled with hammer and chisel, instead of the calculus, I might now have been the rich man you take me for."

Peter took hold of my sleeve. "Look here, old chap," he cried, "perhaps your luck's been out, but I know just the thing to suit you. You know the old man—my uncle. He doesn't know a left hand thread from a right hand one, but he's done well out of engineering during the war, and has just bought up the Timbuctoo Electric Co. Well, I know he wants a technical man. What do you say to my proposing you?"

"Thank you. Thanks very much. I should be very pleased—of course, providing the salary would be right."

"Oh, yes. No need to worry about that. Just think it over, and let me know the salary you want (just what you think you're worth, you know), and I'll fix it up with the old man right away."

The next morning saw me at Peter's door.

"Have you reckoned it out?" he asked.

"Yes, I have it all down on this paper," I answered. "Let me explain. First of all, Jim Penman, the clerk, gets £5 a week, and I guess I'm worth that. Then my school and university training, together with my experience, swallowed close on £800. Interest on that at 7 per cent. means an extra £56 a year. To repay the capital in, say, 16 years means another £50. Then surely my value above that of Jim Penman can be put at a minimum of £1 per week. Putting all these together we arrive at a salary of £408 per annum, thus:—

| | |
|---|---|
| Basic salary ... ... ... ... ... ... | £250 |
| 7 per cent. on £800 ... ... ... ... | 56 |
| For repayment of capital ... ... ... ... | 50 |
| Minimum value above the basic salary, say ... | 52 |
| Total ... ... ... ... ... ... | £408 |

"What!" cried Peter, "only £408 a year! Why, the old man wouldn't impose. I'll tell him six . . ."

* * *

Loud coughing outside, a knocking on my bedroom door, a shrill voice through the chilly air, awoke me to reality and a roaring March morning.

It was Saturday. With a childlike hope born of my dream, I opened the Review at the list of vacant posts. To my dismay I found that one optimist wanted a technical man for £3 a week. A college anticipated another Kelvin for £200 a year. An insurance company desired a man's body and soul for a like amount. I closed the paper, and if a heart can be broken I knew mine was.

Next time I come on earth I shall closely examine the possibilities of life as a taxi-driver, hotel porter, bookie, shopkeeper, or trade union secretary, before rashly joining that ascetic band of unselfish saints—the technical engineers.

## CORRESPONDENCE.

*Letters received by us after 5 p.m. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

### Trading Agreements.

Can you, please, inform me what good purpose the trading agreements which we have on all hands to-day fulfil?

Take the E.L.M.A., for instance. Here we have a document which ties up the retailer or contractor to lamps of certain makes only. He may be (if he be a contractor) stuck fast on a job meaning hundreds or thousands of pounds to him, but if he cannot get "ring" lamps—we all know how scarce 100-watt half-watts are—he must perforce do without his money until the E.L.M.A. firms are pleased to deliver, although he could get non-ring lamps at once.

He may be asked to quote for a certain type of lamp, but because it is not a product of the Association, he cannot touch it.

Are not the above two instances restraint of trade?

Any retailer knows from the number of people who, when refused discount, walk away without buying, that dozens of firms do make concessions to casual buyers. An honest man cannot make any allowance, but his dishonest neighbour, who apparently will sign any agreement you like without the slightest intention of keeping it, reaps the profit and collars the customer. And there is no redress, no retribution overtakes the wicked one. The E.L.M.A. cannot find him out (does it ever try to find anyone out?), and the so-far honest competitor is driven almost to break his word. After all, it is easy to allow a man 10 per cent. or 20 per cent. off a lamp or two if you get all his work; you soon get the discount back. In short, these agreements simply breed rogues, and I would ask how many retailers keep strictly to their agreements? How many allow 2½ per cent. cash monthly? How many render two statements, one for work and general supplies, less 2½ per cent., and another for the all-sacred lamp net? And when the usual hard-headed business man you are doing the work for (they are all hard-headed when they've got to pay) says: "Why the difference? Cash in a month is worth 2½ per cent. whether it is for lamp-holders or lamps, and 2½ per cent. I will take," what steps have to be taken to get the deduction refunded? Why, it cannot be done!

How *can* you persuade a buyer for a graded firm that when he wants lamps for his own use he must pay 25 per cent. more for them? It is an insult to his intelligence.

Replies to the above queries will be thankfully received by

**Pedalis.**

### Lubrication.

Referring to the article on "Lubrication" in your issue of February 27th, we beg to say that it was impossible in the time at our disposal when we gave our paper on "The Theory and Practice of Lubrication: The Germ Process," to go into many details of the subject. It was a preliminary paper to others to follow later on, as time and opportunity occur, as stated at the meeting.

The name "Germ" process, we explained, is used owing to the inherent fear of the word "acid" by chemists and engineers. Had we called it the "acid" process, the mere name would have ruled it out of court as an "impossible proposition" by every oil user. In fact it would hardly have got into any laboratory before being condemned out of hand, executed, and buried without ceremony and faint hope of trial on merit.

As a matter of fact, we used this name in the paper to avoid the semblance of punting our proprietary names by which the oils are sold, and to keep the subject on the level of a scientific contribution on the subject matter. They are sold as "Aptol" lubricating oils, or the lubricating "concentrate" as "Tonikol."

With reference to cheapening oils, towards the end of the paper we stated that "great economies may be anticipated from the use of oils made on this 'process.'" In comparison

with oils compounded with fatty oils an economy of 10 per cent. to 15 per cent. in cost price for the same work is assured. The quantitative economy in mineral oil for many purposes cannot be definitely stated until exact records are collected from many trials in progress. We estimate 15 per cent. to 20 per cent. reduction in oil consumed.

One intention of the paper, as stated, was to clear away much prejudice, mistrust, and suspicion of the oil chemist and the oil manufacturer. When this is done, we trust a little more confidence in their good faith than hitherto experienced may result, followed by trials in actual practice. Without practical trials even the best theoretical work halts at the threshold of becoming available for practical utility in everyday use.

**Henry M. Wells and James E. Southcombe.**
*Joint Authors.*

London, S.W. 1.
*March 2nd*, 1920.

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### The Morse Code on the Gramophone.

I understand that gramophone disks have been prepared for the purpose of "home lessons" in telegraphy, being records of spoken words followed by the appropriate Morse code signals. Any information concerning the above, and especially as to the makers thereof, would be much appreciated.

**E. C. Barton.**

London, S.W.
*March 3rd*, 1920.

[Such records are sold by Messrs. Gamages, Ltd., Holborn, E.C. 1.—Eds. Elec. Rev.]

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### A New Thermionic Valve.

I have read with interest a description given in your last issue of a new thermionic valve, and would like to point out that some experimental valves which I made up during the war, to Dr. Erskine Murray's design, gave characteristics almost identical with those shown in the valve described by Mr. Scott Taggart.

It is perhaps to be regretted that the experimental work which has been done on wireless valves during the war has not been published.

This I know to be due to the fact that the technical people responsible for the production of valves for war purposes have been too much engaged in problems of reconstruction to be able to give this matter their attention.

**S. R. Mullard.**

London, S.W.
*March 4th*, 1920.

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### A Model Employer.

On February 13th there appeared in your "Situations Vacant" columns an advertisement for a staff for a modern E.H.T. power station in Liverpool district. It stipulated that the "working week comprises seven 8-hour shifts."

It will interest many of your readers, particularly central station men, to know that this advertisement emanated from Messrs. Lever Brothers, Ltd., who have a station, now nearing completion, at Brombro', near Port Sunlight. Having been under the impression that this firm was a "model employer," I was greatly surprised and also disappointed to see a company which had enjoyed a reputation for good conditions of employment stipulating seven days' work per week. In view of Lord Leverhulme's advocacy of better working conditions, which, however, he apparently does not give his own employés, can it be wondered that the worker is distrustful of combines and capitalists?

**Sunlight.**

*March 4th*, 1920.

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### Electrolytic Meters.

With reference to the correspondence regarding meters, we had not intended entering into this, but your correspondent, "A. W. C.," makes statements which may be misleading to those who have not had much experience of our electrolytic meters.

We refer more particularly to the remarks concerning crystallisation and vibration, as while it is true that these troubles existed many years ago, we can definitely guarantee that no meter sent out from our works since the year 1905 has shown the slightest sign of crystallisation, and that meters fitted with our spring suspension will work under any conditions of vibration that a motor meter will work under.

We should be pleased to demonstrate these points to your correspondent if he cares to visit our works.

With regard to the other points of "A. W. C.'s" letter, we would mention that a small amount of common-sense organisation is all that is required to overcome these suggested troubles, and in this connection would point to the fact that there are a very large number of engineers who prefer this meter to any other, no doubt on account of the many advantages it offers over motor meters.

We do not wish to burden your "Correspondence" column with details of these advantages, as they are so well known to the majority of engineers, but anyone interested can have any information required by applying to our works.

**Reason Manufacturing Co., Ltd.,**
Victor Breeze, *Technical Director.*

Brighton.

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### The Principle of Relativity Simply Explained.

I venture to call attention to a slight inaccuracy contained in the article contributed by R. W. Western, in your issue dated September 26th, 1919.

Referring to page 388, paragraph 1, of this article, the distance $A A_2$ should read $Ta \sqrt{c^2 + v^2}$, but the effect of making this alteration is to change the ratio for time to $\sqrt{1 + \beta^2}$.

The ratio given in the paragraph ($\sqrt{1 - \beta^2}$) is, I presume, correct, the error consisting of an incorrect statement of the case, thus :—

In the estimation of "A," the light passes from A to $A_1$, in time $Ta$, "B," however, thinks the light passes from A to $A_2$ in time $Ta$, and this distance, in his estimation, will be $c\,Ta$; distance $A_1$ to $A_2$ will be $v\,Ta$, and distance A to $A_1$ will be $Ta \sqrt{c^2 - v^2}$. $Tb$ the time occupied by the light, in the estimation of "B," will be $Ta \sqrt{c^2 - v^2}/c$, whence $Tb/Ta = \sqrt{1 - \beta^2}$.

I trust your contributor will not find in the above reasoning sufficient evidence to warrant a practical experiment in the fourth dimension suggested by your correspondent, Mr. Carl Hering.

**Edmund G. Staygle.**

Electricity Works, Tonbridge,
*March 6th*, 1920.

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### Tale of a Cat.

In your issue of February 27th, an illustration was given of an electrical breakdown at the Daimler Co.'s works, due to a rat having attempted to walk across the high-pressure terminals of a switch. Enclosed is a photograph of a precisely similar occurrence, which was caused by a cat.

The incident occurred several years ago at the works of a client of my firm, Messrs. Criterion, Ltd., from whom we received an

urgent summons by telephone, as the high-pressure supply had failed. On investigation, the cat was found well roasted.

There was a space of a few inches at the bottom of the high-pressure switch cubicle, which was in an unfinished state, and it is presumed that the cat got inside the cubicle and up to the switch for warmth.

An unfortunate venture for poor puss!

**Frank J. Moffatt.**

Birmingham, *March 2nd*, 1920.

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### Radiators for Bath-Rooms.

In answer to "Radiator's" letter in your "Correspondence" columns for February, we make a complete line of glazed earthenware fires from 700 watts to 3,000 watts capacity, as per enclosed pamphlets. These fires were demonstrated at the "All-Electric House" at the Olympia Ideal Home Exhibition, and can be seen in our show-rooms throughout the country. Delivery from stock.

**The General Electric Co., Ltd.,**
C. G. Nobbs,
*Manager of Heating and Cooking Department.*

London, E.C.,
*March 1st*, 1920.

### The Einstein Theory.

I have reason to believe that a simple explanation will be published next month in the forthcoming issue of "Hibbert"—a quarterly journal which every engineer ought to read regularly.

Mr. Carl Hering's remarks appear anything but original to anyone who has heard of "Fluxions"; but pardon my saying that your own remarks, Sir, about Time show the necessity for a little clear thinking.

There is no such thing as Time—for the simple, but sufficient, reason that Time is not a thing! It is merely *an idea* which occurred to our remote ancestors as soon as they became "brainy" enough to notice that objects moved. If nothing moved, no one could have any idea of Time—that is of *Duration*, which can be expressed very unscientifically as *Space divided by Movement*—movement or motion being the state (condition) of a body whose position, relatively to its surroundings, is changing.

W. H. M.

*March 6th*, 1920.

[We are not sure whether our correspondent is here discussing metaphysics or metamathematics; but we ourselves said: "time is associated with motion," and we do not see that he carries the matter any further.

It is curious to note, on the other hand, that "according to the theory of relativity, if the observer is moving with the velocity of light, time remains unchanged." We do not profess to be able to reconcile these two propositions.—Eds. Elec. Rev.]

## BUSINESS NOTES.

**To Our Readers and News Contributors.**—We shall be glad if reports and notes regarding social and other events can be sent to us as soon as possible after those events have taken place. Very frequently, especially of late, we have received notes of this kind five or six days after the functions, and as printing arrangements compel us to go to press early, such news cannot be published until it is a fortnight old. If somebody is deputed to send a paragraph to the Electrical Review immediately after the event, long delays in publication will in most cases be avoidable.

**Football.**—Messrs. Dick, Kerr's (Preston) team visited Coventry, Siemens (Stafford) in the first round of the Cup presented by Sir Charles Ellis for competition amongst electrical works staffs. The Preston party monopolised the game, and secured a 5—1 victory.

**D.O.T. Officers to Visit Industrial Centres.**—Arrangements have now been completed for the periodical dispatch of officers of the Department of Overseas Trade having specialised knowledge of particular trades to the more important industrial centres throught the country, for the purpose of bringing the Department more directly into touch with provincial firms than has been possible hitherto. With the co-operation of the Association of British Chambers of Commerce, the necessary facilities will be provided by the local Chambers of Commerce to enable the representatives of firms desiring to export British goods to interview the officers of the Department in their own locality. This, it is hoped, will obviate the inconvenience of travelling to London for the purpose of consulting the Department on matters connected with overseas trade. It is intended that the visits of officers shall be monthly, and will extend in each case over a period of about five days. The following programme has now been definitely arranged for the next two months:—

| | | | | |
|---|---|---|---|---|
| Birmingham | Chamber | of | Commerce | 8th/12th March. |
| Manchester | " | " | " | 15th/19th " |
| Glasgow | " | " | " | 22nd/26th " |
| Sheffield | " | " | " | 29th March to 1st April. |
| Bradford | " | " | " | 12th/16th April. |
| North Staffordshire | Chamber | of | Commerce (Tunstall) ... | 26th/30th " |

The officers visiting the centres named will deal with inquiries connected with overseas trade possibilities and conditions, and, as far as may be possible, will discuss such matters as the following:—

1. Contracts open to tender.
2. Overseas demand for particular goods.
3. Importers of various goods in overseas markets.
4. Agencies for British manufacturers.
5. General conditions obtaining in overseas markets, including:
   - Best method of marketing and distribution.
   - Credit conditions.
   - Terms of payment.
   - Nature of competition and best methods of meeting same, &c.
6. Shipping and transport.

It is further hoped that these visits may be the means of enabling the Department to keep abreast of local industrial developments in their bearing on overseas trade. Applications to interview the Officers of the Department should be addressed direct to the Secretary of the Chamber of Commerce at the most suitable centre named above.

**Liverpool Electrical Dispute.**—There is every prospect of an early settlement of the dispute at Liverpool between the Electrical Trades Union and the National Federated Electrical Association over a new code of working rules. Our correspondent understands that a meeting has taken place between the Liverpool representatives of the Electrical Trades Union and the Association, and that certain decisions were arrived at which require the ratification of the operators on one hand and the Council of the National Federated Electrical Association on the other. The men, meanwhile, are withholding their labour, having refused to return to work pending negotiations. The dispute is now in its ninth week.

**An Indian Inquiry.**—Messrs. Daisy & Co., import merchants and agents, of 2/105, Armenian Street, P.O. Box No. 149, Madras, desire to receive samples and price information from British manufacturers of electrical fittings and accessories, as they are developing the business of their electrical department.

**Plant for Sale.**—Rochdale Corporation has for disposa two Bruce Peebles 120-kw. La Cour converters, direct coupled to generator; Tynemouth Corporation Electricity Department invites offers for two Holmes-Bellis and one Westinghouse-Bellis steam generators, each 190 kw. D.C. For full particulars see our advertisement pages to-day.

**Coal in South Africa.**—We have received a "Special Coal Number" of the *South African Mining and Engineering Journal*, Johannesburg, dated December, 1919, price 2s. 6d., in which is concentrated a veritable "mine" of information on the subject of the fuel resources of the Union of South Africa (p. 23). We note that Sir Dugald Clerk's statements regarding the virtues of gas have been taken literally, and that the "71 per cent. of the original total heat of the coal" which he claims for the carbonisation of coal is accepted at its face value, and used as an argument in favour of delay in the erection of large electric power stations, and the electrification of railways. We again point out that the "71 per cent." is a gross figure, and does not represent the net available heat—still less does it represent the available *energy* of the gas, coke, and tar, seeing that not more than one-third of it can be utilised for motive power. Moreover, as is pointed out on p. 23, electric power is generated at large stations from small waste coal, which is useless to the gas works. Apart from this aspect of the subject, the issue is an admirable one, containing an immense amount of detailed information.

**Lead.**—Messrs. G. Cawson & Co. report under date March 6th:—

> The supply of lead for consumers is still quite abundant. There, however, is less Broken Hill coming forward, and no arrivals are expected for some few weeks, although lead still continues to come in from other directions. Some reports predict a shortage of lead later in the year. This may or may not turn out to be correct, as the output may change very considerably during the next few months. We cannot pretend to tell at present what may be the ideas of speculators. There seems to be an opinion that they may take the market in hand and give prices a fresh push upwards. The position is now probably ripe for such an operation, as most of the weak holders have cleared out.

Messrs. James Forster & Co., on the same date, stated:—

> The immediate future of the market is in the hands of the Controller. . . . We suggest that those who have bought the stock should pay for it where it lies, with an allowance for delivery. If it is shipped to London by the thousands of tons, it will probably go to America, with disastrous results here. . . . Our view is that a famine in lead in the summer is inevitable, and that if the Government stocks are allowed to go to America, we shall experience great scarcity before next month is out.

**Italian Companies.**—Six large Italian electrical companies are in process of increasing their capitals by large amounts:—The Società Industria Elettrica Schledense (Schio), from 300,000 to 1,000,000 lire; the Società Italiana di Elettrochimica (Rome) from 10,000,000 to 24,000,000 lire; the Società Italiana Telefoni Poivati (Milan), from 4,500,000 to 7,500,000 lire; the Società Generale Elettrica della Sicilia (Milan), from 32,000,000 to 50,000,000 lire; the Società Italiana dei Forni Elettrici e dell' Elettro-Carbonium (Rome), from 6,825,000 to 14,000,000 lire; and the Società Anglo-Romana (Rome), from 40,000,000 to 50,000,000 lire.

The Società Forze Idrauliche dell' Alto Po (Milan) has decided to transfer its quarters to Genoa, and elect a new council. This company is now controlled by the Negri.

There has been formed the Società Anonima A, B, G, D (with office at 22, Via Bigli, Milan), for the working of electro-mechanical patents, and the manufacture of and trade in mechanical apparatus. The capital is 600,000 lire, raisable to 1,000,000 lire.

The Società in Accomandita, "Sormani Aldo e Ca.," has been established at Netro, for the construction and repair of electrical material for lighting and power. Capital, 35,000 lire.

The Società Anonima Monti e Martini-Fabbricka Riunite Materiale Elettrico has been set up at Milan, with a capital of 2,000,000 lire.

The Società Itala per Forniture Elettriche has been established at Rome, with a capital of 100,000 lire.

**French Companies.**—Under the style of Henriquel et Noël, with offices at 15, Rue Delayrac, a company has been founded at Fontenay-sous-Bois, Seine, for the carrying out of mechanical and electrical undertakings; capital, 25,000 fr.

The Société Commerciale de l'Appareillage Gardy is the title of a company formed at 15, Rue de Milan, Paris, for the purchase, sale, export, and import of all kinds of electrical material, including ceramics. Capital, 100,000 fr.

The Société de la Forces de la Sélune is about to issue 2,000,000 fr. worth of 6 per cent. bonds.

**Reunions and Socials.**—The staff and friends of Greenock Corporation electricity department met in a social capacity in the Tontine Hotel on February 25th, the occasion being the annual dance of the department. Mr. W. McGibbon, installation superintendent, was responsible for the decoration of the hall, a novelty in this connection being the use of four British Thomson-Houston floodlight projectors fitted with coloured screens. The kaleidoscopic effect of these colours on the ladies' dresses was too beautiful for words. The company included Mr. F. H. Whysall, burgh electrical engineer, and Mrs. Whysall; Bailie Russell, vice-convener of the Electricity Committee, and Mrs. Russell. Representatives of many leading engineering and manufacturing firms were also present. The programme, which included a number of the old popular dances, also contained many of the latest examples of the terphischorian art. The duties of the M.C. were capably executed by Messrs. W. Woodrow, N. Watson, and A. Lang. Mr. Roberts, meter superintendent, was responsible for the arrangements.

A grand concert, followed by a whist drive and dance, was held at the Borough Hall, Greenwich, on March 3rd, and was attended by employés of Messrs. Elliott Bros. (London), Ltd., Century Works, Lewisham, and their friends, to the number of about 500. The arrangements were in the hands of an Organising Committee consisting of members of the "Elliott" Social Association. The concert was arranged by Mr. Raymond O. Smith, secretary to the company, who also conducted the "Century Works" orchestra, which rendered selections from well-known composers. The vocalists were Miss D. Mackay Webster, Miss Helen Sola, Mr. Leslie Wissler and Mr. Ben Lawes, a member of "The Follies." Monologues were given by Mrs. R. O. Smith. Refreshments were served and there was dancing in the small hall, which had been engaged for this purpose. Mr. A. Treliving acted as M.C., and Mr. R. D. Johnson's Imperial Band provided the music. The whist drive was held in the large hall, about 45 tables being occupied. Mr. L. W. Smith, a director of the company, who also distributed the prizes, was M.C., assisted by Mr. W. F. Beaden.

The Social Club connected with Pope's Electric Lamp Co., Ltd., (Willesden), held a whist drive and dance at the Leopold Road Schools, Harlesden, on 3rd inst., about 450 of the staff and workpeople being present. The prizes were presented by Mrs. F. L. Pope. Mr. Pope, Mr. E. A. Marx (sales manager) and Mr. Stanley Carman (works manager) were present.

**Trade Announcements.**—Sir J. F. Payne Gallwey, Brown & Co., Ltd., with a capital of £50,000, have acquired the interests of Messrs. Payne Gallwey, Brown & Co., formerly trading at 49, Queen Victoria Street, E.C. 4. The offices of the new company are at 58, Victoria Street, S.W. 1. Sir J. F. Payne Gallwey and Mr. C. L. Brown, A.M.I.E.E., are joint managing directors. The company carries on the business of a central organisation for the distribution of machinery, equipment and stores for collieries and works, exporters and importers, and it also carries out complete equipment of collieries, &c.

Messrs. Brolt, Ltd., of Birmingham, have built and equipped a large works and head office at Rood End Road, Oldbury, to meet the increased call for their manufactures. The Princip Street works will be continued as a repair and service depôt.

Mr. J. Dyson, electrical engineer, of 7, Aldermanbury, Bradford, has acquired additional premises at No. 1, Hustlergate.

Messrs. Paxton & George have started in business as butchers' outfitters and electrical engineers at St. Peters, Gilmore Place, Edinburgh, and they desire to receive electrical manufacturers' catalogues, display cards, &c. Mr. W. J. Paxton was for some years on the engineering staff of the Clyde Valley Electrical Power Co.

Messrs. John Armstrong & Co. are commencing business as electric light and power engineers, at Lancaster Buildings, Barton Square, St. Ann Street, Manchester. Manufacturers' lists are asked for.

The Electrical Specialities Co., Ltd., whose registered offices are in Sheffield, have taken over the wholesale business carried on by Electro Agencies, of 21, Woodstock Street, Oxford Street, London, W. 1, where the business will be carried on as usual.

**New Spanish Company.**—The Sociedad Hidro-electrica del Cado is the name of a new company which has lately been formed in Barcelona, with a capital of 7,500,000 pesetas.

**Catalogues and Lists.**—The Falkirk Iron Co., Ltd., Falkirk.—List No. 219. Priced and illustrated leaflet dealing with the latest development of the "Falco" electric cooker. The makers state that deliveries can be made from stock.

Fuller's United Electric Works, Ltd., Woodland Works, Chadwell Heath, Essex.—Catalogue 69, describing portable accumulators (principally designed for automobile starting and lighting), hand-lamps, and small armoured cables. Priced and illustrated.

Automatic and Electric Furnaces, Ltd., 281-283, Gray's Inn Road, W.C. 1.—"Heat Treatment Bulletin No. 19." "The Transformation Ranges of Steel."

The British Thomson-Houston Co., Ltd., Mazda House, 77, Upper Thames Street, E.C. 4.—Sections 1 and 2 of new price-list giving illustrations and prices of a wide range of street lanterns for use with "Mazda" half-watt lamps. Data and characteristic curves are given for each type. Section 2 deals principally with watertight and gastight fittings.

**Calendar.**—The Hackbridge Cable Co., Ltd., of Hackbridge, Surrey, have sent us a handy and pleasing little calendar-card for desk use during the month of March. It is intended to issue such cards monthly.

**Domestic Electrification.**—Copies of the coloured supplement relating to this subject which appears in the *Beama Journal* for February can be obtained from the offices of the British Electrical Development Association (Inc), 84, Kingsway, W.C. 2.

**Foreign Trade.**—February Figures.—The following are the values given of electrical goods and machinery in the official returns of imports and exports for January:—

| | *February*, 1920. | *Inc. or dec.* | *2 months*, 1920. *Inc. or dec.* |
|---|---|---|---|
| Imports. | £ | £ | £ |
| Electrical goods, &c. ... | 91,706 | — 38,153 | — 22,251 |
| Machinery ... ... | 1,383,429 | + 114,154 | + 863,211 |
| Exports. | | | |
| Electrical goods, &c. ... | 629,247 | + 388,974 | + 273,282 |
| Machinery ... ... | 2,743,237 | + 1,260,118 | + 271,243 |

**National Joint Board of Employers and Staff Members (Electricity Supply Industry).**—A special meeting of the above Board was held at the Ministry of Labour on the 6th inst., to consider matters referred to the Board by the E.P.E.A. Mr. R. P. Sloan was elected chairman of the meeting. The E.P.E.A. called the attention of the Board to the action of the Poplar Borough Council in declaring that the E.P.E.A. was not a recognised Trade Union, and instructing certain members of the technical staff of the undertaking to join the E.T.U. or the Municipal Officers' Association. After discussion, the employers' side of the National Joint Board agreed that they would notify the Poplar Borough Council that they recognised the E.P.E.A. as a Trade Union duly registered, and a competent body to deal with matters affecting the technical staffs in the Electricity Supply Industry. The members of the employers' side of the board were further of the opinion that members of the E.P.E.A. in the employ of the Poplar Borough Council should be accepted as belonging to a recognised Trade Union.

The E.P.E.A. cited the case of the Bournemouth and Poole Electric Supply Co., which had instructed one of its senior officers that he must resign his membership of the E.P.E.A., on the ground that "he could not sit on both sides of the table." The employers' side of the Joint Board agreed to notify the Bournemouth and Poole Electric Supply Co. that it had decided that the members of the technical staff "up to and including the deputy chief official" might quite properly be members of the E.P.E.A.

As it is stated that the duties of Mr. Goodyer are such as to bring him within the above grades, no exception can be taken to his membership of the E.P.E.A.

The E.P.E.A. referred to the position of affairs at Stalybridge, and the evidence indicated that the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board had

(*a*) Refused to institute a Committee of Inquiry into this dispute.

(*b*) Refused to refer the dispute to the employers' side of the National Joint Industrial Council (Electricity Supply Industry).

(*c*) Refused to hear the representatives of the E.P.E.A. in connection with the dispute.

The employers' side of the National Joint Board agreed to urge the Minister of Labour to order an inquiry into the dispute between the Stalybridge Board and the E.P.E.A. Further particulars as to the Stalybridge dispute appear in our "Notes" pages.

**American Westinghouse Employés Insured.**—One of the largest group insurance policies on record has been issued by the Hartford Travellers' Insurance Co. to the employés of the Westinghouse Electric Co., who have been insured for $20,000,000.—*The Times.*

**A German Amalgamation Rumour.**—Reports were in circulation on the Berlin Stock Exchange, last week, to the effect that negotiations were proceeding with a view to the amalgamation of the F. Krupp Co., the A.E.G., and Felten & Guilleaume. It is unofficially explained, however, that the rumours were due to a proposed agreement under which the Krupp Co. would supply the A.E.G. with a definite quantity of semi-finished materials.

**Auction Sales.**—By order of the Controller, Aircraft Department Disposal Board, Messrs. Goddard & Smith will sell by auction, on March 26th, at Earl's Court Exhibition, a quantity of balloons and balloon gear, also about 3,500 2-volt accumulators, insulating cable, &c. Assets Auctions Co. will sell by auction on March 18th, at Newington Causeway, the stock of an electrical factor. For particulars see our advertisement pages to-day.

**Dock Electricians' Strike.**—Owing to four G.P.O. employés engaged in installing telephones being non-Unionists, all the electricians at the Tilbury, Millwall, Blackwall, and Royal Albert Docks stopped work on Saturday last as a protest against the employment of non-Union labour, says the *Westminster Gazette*. A liner had to leave Tilbury in an unfinished condition with regard to electrical fittings, owing to the sudden termination of work by the electricians.

**Liquidations and Dissolutions.**—Collins Engineers, Ltd., 39A, Keens Road, Croydon.—In this matter a summary of the statement of affairs has now been issued, and according to this the unsecured creditors' claims amount to £15,363, while the assets are estimated to produce £6,549. There are other liabilities put down at £3,901, but these are not taken to rank in the statement of affairs. Then claims of the debenture holders amount to £10,000, and the assets are not sufficient to meet these claims by about £3,450, while there are preferential creditors in respect of taxes and wages amounting to £1,300, the deficiency as regards creditors, therefore, being £20,114. As regards contributories

there is stated to be a total deficiency of £25,114. It appears that the winding-up order was made on December 11th, 1919, on a creditor's petition. On October 7th, 1919, one of the debenture holders appointed a receiver, Mr. Maurice L. Wells, of 118, Newgate, Street, E.C., who took possession on that date. The receiver had since been endeavouring to work up a large stock of parts to complete dynamo lighting sets, and although more may now be realised than appears in the statement, there seems no prospect of any dividend for the unsecured creditors. The failure of the company is attributed by Mr. Collins to losses on manufacture of munitions and losses incurred in manufacturing the A.P. Lighting Dynamo Set, which the company believed was a valid patent, but which turned out to be worthless. He further states that the machinery installed by Mr. Robinson, for the purposes of carrying out the munitions contracts was after six months of working found to be unsuitable; that it had to be scrapped and replaced by larger and more expensive machinery, and that the loss of output during that period was serious; that the quality of iron castings supplied by various manufacturers was unsatisfactory in 75 per cent. of the deliveries; that huge rejections of materials were made, and the loss of labour and output on this faulty material was persistent and heavy; that the Ministry of Munitions at last undertook to help to get suitable material, but it was some months before manufacturers could be found to supply a suitable quality; that the Armistice was declared just when proper qualities and quantities of raw materials were coming in and the machinery and labour were co-ordinating, and when the company was delivering 20,000 fuse plugs weekly; that at the end of 1918 the company's trading losses on war contracts had amounted to about £12,500; and that approximately £8,000 expended on the mass production of the dynamo lighting set has been lost.

Cosmos Consolidated, Ltd.—Winding up voluntarily. Liquidator, Sir A. F. Whinney, 4B, Frederick Place, Old Jewry, E.C.

Cosmos Engineering Co. Ltd.—Winding up voluntarily. Liquidator, Mr. T. D. Cocke, 44, Gresham Street, E.C. Meeting of creditors March 19th.

Motive Power Improvement Co., Ltd.—Meeting, April 12th, at 6, Eldon Street, E.C., to hear an account of the winding-up from the liquidator, Mr. D. G. Jarvis.

James Nelson, Johnson & Co., electricians, 25, Porter Street, and 68A, Wright Street, Kingston-upon-Hull.—Messrs. T. Hall and J. N. Johnson have dissolved partnership. Mr. Hall will attend to debts.

Furneaux & Thomas, electrical engineers and contractors, Swansea.—Mr. A. L. Furneaux and Mr. A. G. Thomas have dissolved partnership. Debts will be attended to by Mr. A. G. Thomas.

Johnson, O'Sullivan & Co., electrical engineers, 5, Manor Parade, Church End, Finchley, N.—Mr. H. W. Johnson and Mr. J. O'Sullivan have dissolved partnership. Mr. H. W. Johnson will attend to debts and continue the business under the same style.

**Merchandise Marks Committee.**—This Committee met at the Board of Trade, last week. Witnesses on behalf of the Association of British Chambers of Commerce and the Sheffield and London Chambers of Commerce dealt with the marking of imported, transhipped, and re-exported goods, and considered, among other things, the problems arising in connection with imported raw materials and with goods which undergo processes in more than one country. The probable effects of the adoption of empire, national, and community marks of origin were considered, and representations regarding the improper use of British hall-marks abroad were made by the Sheffield Chamber. The questions of the marking of imported goods, the prevention of false descriptions, the use of national trade-marks, and the protection of British marks in foreign countries were dealt with from the points of view of their respective industries.

**British Trade with France.**—The British Chamber of Commerce in Paris reports a membership of nearly 2,000, as against 800 before the war.

**Book Notices.**—"Mathematical Tables." Price 4s. 6d. net. Pp. 80. "Five-figure Logarithms and Trigonometrical Functions." Price 1s. 6d. net. Pp. 40. By W. E. Dommett and H. C. Hird. London: James Selwyn & Co., Ltd.—The former forms the second volume of a series of engineering tables and data, and contains five-figure logs, hyperbolic logs, and logs of functions, trigonometrical tables, general tables of squares, cubes, roots, &c., decimal equivalents and conversion tables, and mensuration tables for circles and spheres. The text is clearly printed and set out, on matt-surface paper, the lines being grouped where possible, to facilitate reference, and the decimal equivalents are generally carried only to five figures, which is ample for most purposes. The second book (a paper-backed brochure) contains the most useful of the tables given in the larger volume. All the tables are upright, which is by far the most convenient arrangement.

"Aluminium Sheet," "Aluminium Circles," and "Aluminium Tubes," are three pamphlets published by the British Aluminium Co., Ltd., with a view to supplying the information so often sought by those in the aluminium industry. The notes are practical, concise and in a handy form. The B.A. Co. will supply copies gratis to those interested in the subject.

"Electric Lighting in the Home." By Leon Gaster and J. S. Dow (32 pp.). London: Pitman & Sons, price 6d. net.—Notes on effective lighting for a complete house, detailing the requirements of each room.

We have received a copy of the first number of *The Rubber Age*, a monthly paper issued at 1s., from 43, Essex Street, Strand, W.C. 2. There are many notes of topical interest respecting rubber and the rubber trade, and subjects dealt with in article form include:—The future of the rubber industry; rubber for paving and flooring; rubber shock absorbers; rubber and aviation; the plantation industry, &c.

"The Henley Telegraph," the staff magazine of W. T. Henley's Telegraph Works Co., Ltd. Vol. I, No. 2 (32 pp.), price 6d.—This is a well-produced journal of no mean literary merit; it contains short articles and notes of general interest, and devotes a good deal of attention to the firm's social side.

"Vickers' News." Vol. I, No. 11.—This number includes notes on the Kwall Falls (Niagara) Power Scheme, and other Vickers undertakings.

"Text Book on Machine Drawing for Electrical Engineers." By E. Blythe. Pp. 81, 18 plates. London: Cambridge University Press. Price 20s. net.

"The Propagation of Electric Currents in Telephone and Telegraph Conductors." By Prof. J. A. Fleming. London: Constable and Co. Price 21s. net.

Technologic Paper, No. 143, of the U.S. Bureau of Standards. "A Study of the Deterioration of Nickel Spark-plug Electrodes in Service." 16 pp. Washington: Government Printing Office.—Notes on investigations into the effects of heat, &c., on nickel wire electrodes, illustrated by photomicrographs.

"Tilling-Stevens Gazette." Vol. I, No. 1 (16 pp.).—This first number of the magazine for the employés of Messrs. Tilling-Stevens, Maidstone, is well produced and illustrated.

**A Dutch Export Veto Raised.**—The Dutch Ministry of Commerce and Industry has just issued an order removing, as from March 1st, the export veto on dynamos, motors, apparatus, &c., with the exception of electricity meters.

**German Export Veto Removed.**—The export veto imposed by the German Government, last December, has been abolished in the case of spare parts for electrical machinery, arc lamps, and electrical heating and cooking apparatus.

**New French Electrical Company.**—A new company has lately been formed in Paris (39, Rue des Acacias) with a capital of 2,000,000 fr., and the title La Société Le Transformateur (Matériel Electrique et Mécanique).

## LIGHTING AND POWER NOTES.

**Athlone.**—Electric Lighting Scheme.—Owing to the unsatisfactory state of the gas works, the Council has called in an expert to prepare a scheme of electric lighting for the town.

**Barnstaple.**—48-Hour Week.—The Town Council has adopted the 48-hour week system at the electricity works, and additional staff has been engaged accordingly. The wages of almost all the employés have been increased, and the assistant electrical engineer is to receive an additional £25 per annum.

Proposed Price Increase.—The Town Council has applied to the Electricity Commissioners for an order to increase the maximum charge for electricity.

**Batley.**—Loan.—The Electric Lighting Committee is seeking borrowing powers for plant and cable extensions.

**Blackburn.**—Electricity Supply.—It has been decided to inquire from the Darwen Corporation whether it is still desirous of Blackburn supplying electricity next winter; also to apply to the Commissioners for permission to supply electricity to the townships of Rishton, Wilpshire, and Great Harwood, situated on the borough boundary.

New Plant.—The Town Council has adopted the report of the electrical engineer advising the purchase of an additional 10,000-KW. set and accessories at the new Whitebirk station. Mechanical soot-blowers are recommended for all boilers in this station.

**Blackpool.**—Rebate.—The rebate to domestic consumers, consequent upon the reduction in coal prices, has been fixed by the Electricity Committee at ½d. per unit from January 1st last.

**Birkenhead.**—Loan Sanctioned.—The Town Council has received sanction to a loan of £21,331 for plant, mains, &c.

**Bolton.**—Proposed Price Increase.—The electrical engineer has submitted the following suggestions to the Electricity Committee to meet the increased cost of production. The price per unit for lighting to be raised by 0·1d., with a minimum charge of 30s. per annum. Power to ordinary consumers to be increased by 0·2d. per unit. To bulk consumers the charges should be raised from the present scale of 30s. to £2 10s. per KW. to a new scale ranging from £3 8s. to £3 18s. per KW. The charges to bulk consumers not included in this scale to be increased by £1 per KW.

**Bradford.**—Sub-Station.—A scheme for the reconstruction of the Bolton Road sub-station has been selected from five alternative proposals by the city electrical engineer.

The Electricity Committee has approved the laying of mains to Richmond Road, Longside Lane, and elsewhere, at a cost of £425.

**Braintree.**—Bulk Supply.—At a recent meeting of the Council, a report of the Electricity and Lighting Committee regarding the advisability of obtaining a bulk supply for the district was adopted, and a licence is to be applied for.

**Colwyn Bay.**—Bulk Supply.—The North Wales Power and Traction Co. has commenced the erection of overhead lines from the Dolgarrog station by means of which a bulk supply is to be transmitted to Colwyn Bay under the terms of a recent agreement.

**Colchester.**—Price Increase.—The Town Council has increased the price of electricity to 9d. per unit for lighting and by ½d. per unit for power.

**Continental.**—France.—According to the *Economiste Européen*, the French found no large water-power works in Alsace-Lorraine, but these provinces might well supply 1 million H.P. if the scheme for exploiting the Rhine from Bale to Lauterburg were realised. Portions of this scheme were prepared by the German authorities before the war. The French Public Works Department has made further plans of far-reaching importance; eight power works are to be erected, extending from the Swiss frontier to Markelsheim, near Strasbourg, which will develop on an average 800,000 H.P. Later on the water of the section of the Rhine below the influx of the Ill will be utilised.—*Economic Review.*

Discussing the question of the advisability of importing coal or electrical energy produced in England to work French railways, the *Revue Générale d'Electricité* says:—M. L. Neu has submitted to the Ministry of Industrial Reconstruction the idea of substituting the importation of electric energy from England to France, for the importation of coal. The question of the use of undersea cable for high-tension current may, he says, be considered as settled, since an installation of this kind has been working for several years between Sweden and Denmark, at 25,000 volts for a power of 50,000 KW. M. Neu's problem, therefore, involves no new principle.

Application has been made by the Electrique de Bretagne, located at Rennes, for a concession from the State, on public utility grounds, to set up a distribution network to serve the districts comprised within Guichen (départ. Ille-et-Vilaine), and Châteauneuf (départ. Cotes-du-Nord), with branches to Dinan, Bécherel, Dol, Combourg, Rennes, and Châteaubourg-Jauzé.

In the mining region of Marles, Pas de Calais, 125,000 miners are on strike. All the local railway workers and employés at the electrical works have also ceased work. It is feared that the trouble may spread to Bruay and other mining centres.—*Daily Mail.*

Switzerland.—The North-East Switzerland Power Works, which has largely increased the power generated in the last few years, intends to erect three new generating stations, viz., at Bottstein-Gippingen, on the Aar, at a cost of fr. 65 millions, to generate 260 mill. KW.-hours; and at Wäggital, near Zürich, at a cost of fr. 60 mill., to generate 60 mill. KW.-hours. The company intends to issue new capital for fr. 114 mill., viz., fr. 34 mill. in ordinary and fr. 80 mill. in preference shares. The shares will be divided among the cantons.

The company proposes to issue a debenture loan for fr. 15 mill. and its customers will be asked to pay more for their electrical energy.—*Economic Review.*

Denmark.—The Department of Overseas Trade has received advice from H.M. Chargé d'Affaires in Copenhagen to the effect that the Copenhagen Municipality is considering the vote of nearly 3,000,000 kroner for a 10,000-KW. turbo-generator for the electrical works, and 270,000 kroner for the conversion of 10 boilers to oil firing; 480,000 kroner for tank and piping installations, and 2,202,000 kroner for the extension of transmission and high-tension cables. It is further stated that one or two of the provincial municipalities of Denmark are increasing their electrical plant, and it is suggested that British firms which are represented in Denmark should request their local agents to watch proceedings carefully with a view to obtaining a share of this business. It will be necessary to consider the question of credit terms in view of the unfavourable Danish exchange. At present rate of exchange, 22-23 kroner = £1.

Rumania.—The Ministry of Finance has introduced a Bill to authorise an increase in the taxes on petroleum products and on electricity. It is calculated that the revenue from these two sources will exceed 2,000,000,000 lei per annum.

Germany.—It is reported that a large boiler burst, on the morning of March 9th, at the Rhenish-Westphalian electricity works, burying about 90 workmen. At least 50 persons are estimated to have been killed.

**Dingwall.**—Street Lighting.—The Electric Light Co. has offered to adapt the present gas lamps for electricity at a cost of £625. The Town Council has referred the matter to the Lighting Committee for investigation into comparative costs.

**Doncaster.**—Extensions.—The Corporation has approved estimates totalling £120,850 for the provision of new plant, &c. Application has already been made for permission to borrow £40,000.

**Gillingham (Kent).**—Supply from Dockyard.—The Town Council has decided to grant a licence to the Naval authorities at Chatham Dockyard to supply electricity to the Medway Shipbuilding Co., at works to be constructed at St. Mary's Island, for an agreed period and prices.

**Harrogate.**—Loan.—Borrowing powers are being sought for £15,750 for the establishment of a subsidiary power station near the Royal Bath, and for the installation of two 600-H.P. Diesel engines, to replace vertical steam engines which are now considered obsolete.

**Holme.**—Gift to Council.—The electricity undertaking, inaugurated about six years ago, has been handed over to the District Council. The formal proceedings took place last week, Mr. C. Tinker, the chairman of the Holme Electric Co., making a gift of the whole of the plant to the Council. Mr. Tinker had bought all the shares, representing a capital of £900.

**London.**—St. Pancras.—The borough electrical engineer has been instructed to submit a scheme of extensions to the Electricity Commissioners. This will include the addition of a 7,000-KW. turbo-generator, at an estimated cost of £60,000 and mains extensions in the King Street, Starch Green, Shepherd's Bush, and Wood Lane districts, costing approximately £21,700.

A five-fold increase in the number of consumers during the past year was announced at the annual meeting of the Metropolitan Electric Supply Co., on March 9th. Everything, it was said, pointed to a great broadening out in the use of electricity.

**Loughborough.**—Proposed Extensions.—The Town Council is seeking the permission of the Electricity Commissioners to extend the generating station at an estimated cost of from £150,000 to £180,000. It was stated at a Council meeting that manufacturers' demands could not be met unless these extensions were carried out.

**Maidstone.**—Loans.—The Town Council has applied to the Electricity Commissioners for loans of £15,000 for a 500-KW. rotary converter, switchgear, transformers, &c., needed for the supply of power to works at Tovil, and which will bring in a revenue of at least £14,500 a-year; and £6,500 for mains, &c., for the supply to the Cherry Orchard Estate. The Council is to take steps to supply for hiring purposes fittings and appliances for heating, lighting, and motive power.

**Newcastle-on-Tyne.**—Dividends.—Out of a net profit for the year of £21,593, Newcastle-on-Tyne and District Electric Lighting Co., Ltd., proposes paying a dividend at the rate of 4 per cent. free of income-tax, and carrying forward £13,263. Outlay on buildings, plant and mains totalled £19,000 for the year.

**Salford.**—Loan.—Sanction is being obtained for the borrowing of £144,344 for expenditure upon additional plant and cable extensions. Two items included in the proposals are generating plant (£47,340), and boiler-house plant (£42,000).

**South Shields.**—Prices.—The Electricity Committee has been approached by representatives of several of the largest power consumers, who request that if no reduction can be made in the present charges, which are considered too high, at least a guarantee should be given that rates will not be further raised. After consideration of the proposal, the Committee has decided that a guarantee of this nature can only be given if clauses, governing conditions created by rises or decreases in the cost of labour and coal, are inserted. It is accordingly willing to enter into an agreement over a period of years on these conditions.

**St. Helens.**—Loan Sanctioned.—The Town Council has received permission to borrow £21,414 for the purchase of additional switchgear, economisers, coal-handling plant, &c.

**Swindon.**—Loan.—The Town Council has applied for a loan of £20,000 for additional plant and cable extensions.

**Watford.**—Proposed Price Increase.—Sanction to the Urban District Council's proposal to raise the price of electricity from 8d. to 9d. per unit is being withheld pending the receipt of more complete particulars. The Urban District Council intends to give a supply to Radlett as soon as possible.

**Water Power.**—A special Committee, under the chairmanship of Sir John Snell, is investigating the possibility of utilising water power, both river and tidal, to generate electricity, and is drafting a report on how these means can be profitably employed in Great Britain.

**West Riding (Yorks.).**—Bulk Supplies.—A recent issue of the *Yorkshire Observer* gave some interesting information regarding the number of municipal authorities which have elected to take a bulk supply from a power company rather than incur the cost of extensions. Among these are Dewsbury, Batley, and Todmorden. The Brighouse Council has found it more advantageous to close down the town electricity works and take a bulk supply from the Yorkshire Power Co.

**Wigan.**—Extensions.—The Town Council is to apply for sanction to a loan of £50,000 to carry out extensions, including sums of £24,000 in connection with Ryland's Mills, and £12,000 for the Worsley Mesnes Mill.

**Worthing.**—Loan Sanction.—The Town Council has received sanction to a loan of £3,173 for the renewal of cables.

**Wrexham.**—Price Revision.—The Town Council has adopted the following revised scales of charges for electricity:—Power and heating, for the first 400 units per quarter, 3¼d. per unit plus 10 per cent.; and beyond, 2¾d. plus 10 per cent., less a discount of ¼d. per unit on all energy used, for prompt payment; or 32s. net per quarter for each KW. of maximum demand, plus 1d. per unit, and 30 per cent.; for heating premises lighted throughout by electricity, 1¼d. plus 15 per cent., less ¼d. discount. A special rate of 6½d. per unit less ½d. discount, for factory, workshop, or warehouse lighting where 10,000 units per annum are taken for power, has been abolished

## TRAMWAY AND RAILWAY NOTES.

**Accrington.**—Tramway Shelter.—Mr. T. Gorden, of Blackpool, has promised to defray the cost of a tramway-waiting shelter at Accrington, costing £600.

**Belfast.**—Additional Rolling Stock.—In response to an appeal by a Labour Councillor for better travelling facilities for shipyard employés (numbering 10,000), it was stated that new cars would be delivered by the end of April if there were no industrial disputes in the meantime. The Corporation workshops are to be extended to enable the construction of cars to be accelerated.

**Birmingham.**—By-Laws.—A new by-law is proposed to compel motorists to come to a standstill before passing stationary tramway cars which passengers are leaving or entering.

**Blackpool.**—Advertisements.—The Tramways Committee recently decided to dispense with advertisements on tramcars. Advertisements are to be accepted on the newly acquired Blackpool and Fleetwood cars until present contracts expire, after which advertising is to be discontinued.

**Burnley.**—New Cars.—The Tramways Committee recommends the purchase of five additional single-deck tramcars, and the construction of two sidings and pits at a cost of £19,732. The Ministry of Transport is to be asked to sanction a loan for this purpose.

Fares.—Although it was stated at a Council meeting that wages increased by £24,000, and total working expenses by £33,000, against a revenue increase of £32,000, a proposal to increase 1d. fares by 50 per cent. was defeated.

**Chesterfield.**—Time Extension.—The Minister of Transport has extended the time under the Corporation Railless Traction Act, 1913, for the completion of the overhead equipment, &c., until August, 1921, and for the completion of certain tramways (Corporation Act, 1914) until July, 1921.

**Continental.**—France.—The Administration of the Railways has recently placed an order with Belgian manufacturers for 12,000 passenger coaches, which must be delivered within six months. At the same time, the Minister invited manufacturers to supply 42 new coaches, which are to be coupled to future electrically-driven trains. The Railway Department thus appears to be desirous of being equipped in advance, in view of trials which may be made during the year on the Brussels to Antwerp line, the first on which experiments will be made of electric traction. These coaches cost 250,000 fr. each (£12,000 nominal). They will be built of iron throughout, and will carry 100 passengers. Their length will be 21 metres. We may say in this connection that the 5,000 21-ton metal coaches ordered recently will involve an outlay of 80,000,000 fr. We are assured that the Belgian State is preparing a fresh order for wagons.—*L'Electricien.*

Norway.—The strike on the Christiania tramways has been brought to a satisfactory conclusion, the officials having accepted the Government terms. The tramway company will in future be subsidised by the municipality, being unable to meet its own liabilities in respect of wages, pensions, &c.—*Economic Review.*

Sweden.—The Swedish State Railways have asked the Government for a loan of 75,000,000 crowns for the electrification of the Stockholm-Gothenburg line, in order to save the high costs of fuel. It is calculated that with the present high price of coal the electrification costs will be redeemed in four years.—*Morning Post.*

**Gateshead.**—Fares.—The Town Council has disapproved of the request of the Gateshead and District Tramways Co. to terminate the existing agreement by which the company charges 1d. for all journeys on its routes, and to substitute a scale of fares up to a maximum of 3d. for a journey of 3½ miles. Among other objections is one that the service is inadequate.

**Halifax.**—Year's Working.—The report covering the year ended March 31st, 1919, shows a total income of £149,715, and an expenditure of £111,757, leaving a gross balance of £37,958. The net profit, after deduction of loan interests, income-tax, &c., was £10,767. The total number of passengers carried during the period was 24,516,973, including blind persons and disabled soldiers, who were allowed free journeys.

**London.**—Deptford.—Evidence is to be submitted to the Advisory Committee on London Traffic, in order to prove the necessity of an underground railway for South-East London.

Fare Increase.—On Wednesday, after an all-night sitting, the London County Council decided to increase tramway fares by reducing the distance of the present stages. The new scale will come into operation as soon as the necessary arrangements can be made. A Committee of Inquiry is investigating the general conditions under which the tramways are operated, and, after it has reported, the Council will decide if it shall apply for powers to increase the statutory fare limit.

**Newcastle-on-Tyne.**—Proposed Fare Increase.—The City Council has received a report from the Tramways Committee urging increases in fares. The basis of the proposed new scale is 1d. per mile, 1½d. two miles, and 2d. for three miles. Halfpenny stages, with one exception, are to be abolished, workmen's and school-children's fares to be revised, and free travelling coupons for employés to be discontinued. It was stated that although the increase in revenue since 1915, has been £190,000, working expenses have risen by £234,000, of which £151,000 represents wage increases. With the exception of Glasgow, where the undertaking is being run at a loss, Newcastle is the only town where fares on municipally-owned tramways have remained at the pre-war level. The matter was eventually held over to another meeting. The Tramways Committee is arranging for the purchase of 20 new cars.

**Railway Electrification.**—It is reported that the Minister of Transport has appointed a committee to report upon the electrification of main-line railways.

**St. Annes.**—Opposition to Bill.—St. Annes Tramways Purchase Bill is being opposed by the L. & Y. and L. & N.W. Railway Companies, Lytham Council, and Blackpool Council. An interview has taken place between representatives of St. Annes and Lytham Councils, and a letter containing amended terms has been sent to Lytham Council.

## TELEGRAPH AND TELEPHONE NOTES.

**Cable Delays.**—At a meeting of the Northamptonshire Chamber of Commerce last week, attention was drawn to the delay in cabling to the East. It was mentioned that a transaction involving a sum of £280,000 which would have been completed, had the cable gone out promptly, fell through owing to the difference in the value of the rupee making an adverse difference of about £14,000 in the quotation.

The daily Press announces that the Atlantic-Pacific cable between the U.S.A. and the Far East, which has been interrupted for some time, was restored on February 28th. The Pacific cable between Australia and Canada is still interrupted. The Eastern Telegraph Co. has just laid two new cables, one from Cornwall to Gibraltar, and the other from Malta to Alexandria. The cable ship which completed this work was expected in London last week, and she will load up a new cable to lay between Aden and Bombay. It is hoped to bring this cable into service in May next. Another cable from Gibraltar to Malta, and one from Madras to Singapore are to be laid shortly.

**France.**—A high-power wireless station is to be erected at Croix d'Hinge, near Bordeaux. According to *Weltwirtschaft* it will be five times as powerful as the Eiffel Tower station; it will be completed this year, and will be capable of transmitting 72,000 words per day with a range of 20,000 km.—*Economic Review.*

**Japan.**—A new wireless station has been opened near Tainan, Formosa, says *Weltwirtschaft*, for the use of the Japanese Navy, and another station is to be erected near Lin-shu-tun, in Manchuria.—*Economic Review.*

**New Telephone Exchange.**—Particulars of the Stepney Borough Council's opposition, in view of the shortage of housing accommodation, to the erection of the new telephone exchange at Spitalfields, have been brought to the notice of the London County Council and the Housing of the Working Classes Committee, and the latter authority has been in communication on the subject with H.M. Office of Works, acting for the P.M.G. The erection of the permanent exchange to occupy the whole site (comprising 30 houses and purchased by the P.M.G. in 1913), has, for the present, been deferred, it is now proposed to erect a temporary exchange on a part only of the site, and the disposed tenants will be accommodated in some of the unoccupied houses.

**Portugal.**—A strike of railway, postal and telegraph workers commenced on March 2nd. Disorders have taken place, and railway and telegraphic communication between Portugal and Spain was completely interrupted. The Vigo-Lisbon cable is no longer working.

The principal telegraphic centres have been occupied by military telegraphists, who, after repairing the damage, re-established some of the lines.

Nearly two months have elapsed since the telephone employés went on strike, and the instruments at the Lisbon central exchange were destroyed.

**Ship's Wireless.**—The standard ship's wireless sets in the past have been capable of transmitting messages an average distance of 200 miles, and of receiving messages sent out by stations like Poldhu, up to perhaps 1,500 miles. A ship in mid-ocean in the past requiring to send messages to coast stations on either side of the Atlantic, has had to relay these messages across a chain of other ships. A new maritime wireless set has, however, been evolved by the Marconi Co. employing continuous waves which, although occupying less space than the apparatus in use until now, has an efficient transmitting radius of 1,500 miles. One of these was fitted on the *Imperator*, a second on the *Carmania*, and a third on the *Mauretania*. Business men on the *Imperator* were able to send wireless messages from that ship direct to the British Admiralty wireless station at Aberdeen and the Canadian Government station at Barrington Passage. They were also able to maintain direct communication with the *Carmania*, 1,000 miles distant. The result

was a heavy exchange of traffic in commercial messages, and with the co-operation of the Post Office authorities in this country, some excellent performances in the matter of speed were recorded. It is now possible for a person in London to communicate quickly with passengers on these vessels at any time during their voyage at a charge of only 10½d. per word. Of this 10½d., the Post Office receives 6½d. for shore wireless and landline services. These new wireless equipments on these vessels are additional to the sets hitherto installed, mainly for the purposes of safety at sea, and it is intended that they shall be used exclusively for traffic requirements.

**Spain.**—The Spanish Government, says *Weltwirtschaft*, intends to lay a Spanish-Morocco submarine cable between Cadiz and Larache.—*Economic Review.*

**Wireless Direction-Finding Stations.**—The *London Gazette*, March 5th, contains an Admiralty Notice to Mariners, No. 363 of 1920, which relates to wireless direction-finding stations, and gives regulations for D.F. stations in Canada, Newfoundland, U.S.A., United Kingdom, France, Italy, and Germany.

**Wireless Telephony.**—According to Berlin newspaper reports, the trials of wireless telephony from Berlin to Karlsborg, in Sweden (435 miles), and from Berlin to Moscow (1,060 miles), have proved successful.—*The Times.*

## CONTRACTS OPEN AND CLOSED.

*(The date given in parentheses at the end of the paragraph indicates the issue of the* ELECTRICAL REVIEW *in which the "Official Notice" appeared.)*

### OPEN.

**Aberdare.** — March 20th. Urban District Council. Reconstruction of existing tramways; also new tramways. Mr. E. M. Lacey, 12, Victoria Street, S.W. 1.

**Australia.**—MELBOURNE.—April 12th. City Council. Two 2,000-KW. rotary converters; H.T. switchgear, 6,600 v.; D.C. switchgear, 600 v. (January 30th.)

**Aylesbury.**—March 25th. Installation of electric light in St. John's Church. Specification, &c., from Mr. T. Moore, "Fern Lea," 36, Bierton Hill, Aylesbury.

**Bedford.** — March 31st. Electricity Department. Twelve months' supply of electricity meters and H.T. and L.T. cables. (March 5th.)

**Belgium.**—March 27th. Municipal authorities of Liège. 5,000-KW. turbo-alternator for the central electricity generating station. Tenders to the Bureau des Adjudications des Services Industriels, 3, Rue Saint Etienne, Liége, whence particulars may be obtained.

April 9th. Municipal authorities of Haccourt (Province of Liége). Concession for the electric lighting of the town.

**Blackpool.**—Tramways Committee. Lorry, with telescopic ladder, for repair work on Blackpool and Fleetwood route; also covered motor van.

**Bristol.**—March 22nd. Board of Guardians. Electric lighting installation at Eastville Institution. (March 5th.)

**Carlisle.**—March 19th. Electric light installation, Cecil Street Primitive Methodist Hall. S. W. B. Jack, Architect, 19 Lowther Street.

**Durham.**—March 18th. Board of Guardians. Electric lighting installation at Poor Law Institution, 37, Crossgate. Mr. H. E. Ferens, Clerk to Board of Guardians, Union Offices, 25, Market Place.

**Eccles.**—March 15th. Electricity Committee. 2/500 K.V.A. three-phase transformers. Mr. H. W. Angus, Electricity Works, Cawdor Street, Patricroft.

**Edinburgh.**—March 29th. Electricity Supply Department. Condensing plant for Portobello station. Specification No. 23. (February 27th.)

March 29th. Town Council. Structural steel for the new electric generating station, Portobello. Sir A. B. W. Kennedy, 17, Victoria Street, Westminster.

**France.** — PARIS. — March 30th. Two multiple commutator switchboards; one each for the Bureau central téléphonique, of Vienne (départ. Isère), and the Bureau central téléphonique, of Avignon (Depart. Vaucluse). Tenders to the Direction de l'Exploitation téléphonique, 4e Bureau, 103, Rue de Grenelle, Paris.

**Gellygaer.** — March 21st. Urban District Council. Transformer plant, H.T. and L.T. switchgear, 11,000 v. and 500 v. overhead line material. (February 27th.)

**Kettering.**—March 26th. Electricity Department. Concentric lead-covered feeder cable and feeder pillars. (See this issue.)

**Lincoln.**—April 8th. Electricity Department. Pipework, and motor-generator and switchgear for St. Swithin's power station. (March 5th.)

**London.**—Great Central Railway. March 17th. Stores for 12 months, including electrical line construction, electrical apparatus, wires, cables, lamps, &c. Specifications from Mr. W. Williams, Stores Superintendent, G.C.R., Gorton, Manchester.

**Macclesfield.**—March 15th. County Asylum. Electrical goods for six months. Mr. W. G. F. Tingay, Clerk.

**Manchester.** — March 19th. Electricity Committee. Supply and erection, at Dickinson Street generating station, of direct-current switchgear. Mr. F. E. Hughes, Secretary, Electricity Department.

**Margate.**—March 15th. Town Council. Electric light installation, Municipal Buildings. Borough Surveyor, 13, Grosvenor Place.

**Mountain Ash.**—March 20th. Urban District Council Electricity Department. Transformer plant. H. and L.T. switchgear, three-core and four-core armoured cables and overhead line equipment. (March 5th.)

**New Zealand.**—DUNEDIN.—April 26th. City Council. (*a*) electric car bodies; (*b*) car trucks; and (*c*) car equipment. Documents may be consulted by British firms interested, at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, S.W. 1 (Room 49).

April 31st. Auckland Harbour Board. Electric cranes. Mr. R. B. Burnett, Secretary, Quay Street, Auckland.

**Plymouth.** — March 18th. Electricity Committee. Turbo-alternator, converter and booster. (February 27th.)

**South Africa.**—April 24th. Oudtshoorn Municipality. Time for receipt of tenders extended from March 24th to April 24th.

**Spain.**—The municipal authorities of Caldas de Regas have lately invited tenders for the concession for the electric lighting of the town during a period of 15 years.

### CLOSED.

**Aldershot.**—Urban District Council:—

Cables, turbines, &c., £7,658.—Callender's Cable & Construction Co., Ltd.

**Belgium.**—Tenders were recently invited by the municipal authorities of Villers-le-Peuplier (Province of Liége), for the concession for the electric lighting of the town. Not a single offer was, however, received.

**Birmingham.**—The Corporation has approved a recommendation of the Tramways Committee that 3,000 tons of tramway rails be purchased from the United States Steel Products Co.

**Bradford.**—Electricity Committee:—

Metropolitan Vickers Electrical Co., Ltd., one 70 B.H.P. induction motor for fan with starter.
Ruston & Hornsby, Ltd., steam grabbing crane on caterpillar gear, for new coal storage.
Metropolitan-Vickers Electrical Co., Ltd., one 500-KW. rotary converter and accessories.
Babcock & Wilcox, Ltd., superheaters for boilers.

**Broadstairs.**—Urban District Council. Electric light installation, Pierremont Hall:—

| | |
|---|---|
| **Vernon Hill (accepted)** | **£208** |
| E. A. Pinto | 200 |
| W. J. Cannon | 232 |
| G. M. Willis | 245 |
| Thanet Electric Co., Ltd. | 250 |

**Glasgow.**—Tramways Committee recommended:—

V. I. R. cable.—Liverpool Electric Cable Co., Ltd.
25 tons fishplate bolts.—Ibbotson Bros., Ltd.
Six Ericsson telephones.—M. Breingan.
50 commutators for Witting motors.—P. R. Jackson & Co., Ltd.

The committee considered the following offers for special track work:—

| | |
|---|---|
| United States Steel Products Co. | £11,291 |
| Hadfields, Ltd. | 11,505 |
| E. Allan & Co. | 11,590 |

It was decided that the contract be divided between the two British offerers—Messrs. Hadfields, Ltd., and Messrs. E. Allan & Co.

Clyde Navigation Trustees:—

Electrically-driven de-watering pumps, £27,945.—Worthington-Simpson, Ltd.

**Leyton.**—Urban District Council:—

Tramway trolley wire (3 miles 48 yards) 1s. 4½d.—Fernand Espir, France.

**London.**—STEPNEY.—Electricity Committee. Accepted. Converter plant at Osborn Street sub-station:—

Two 1,500 KW. converters, £15,185.—Bruce Peebles & Co. recommended. The General Electric Co., Ltd., and Messrs. Siemens Bros. Dynamo Works Co., Ltd., also tendered.

50 tons moulded pitch:—

| | |
|---|---|
| **J. Smart & Co.** (accepted) | **£288** |
| T. Crow & Sons, Ltd. | £346 |
| Burt, Boulton & Haywood, Ltd. | £360 |

220 yd. 0·5 sq. in. cable:—

| | |
|---|---|
| **Henley's Telegraph Works Co., Ltd.** (accepted) | **£175** |
| British Insulated & Helsby Cables, Ltd. | £177 |
| W. T. Glover & Co., Ltd. | £195 |

The Committee has accepted the offers of Messrs. Blackman & Co. for two barges of Pooley Hall nutty slack, and of Messrs. Foster & Co. for 100 tons Pooley Hall nutty slack at 32s. 9d. per ton.

The Electricity Committee has received the undermentioned offers for the obsolete steam plant at Osborn Street sub-station :—

| | |
|---|---|
| G. Cohen, Son & Co. | £1,150 |
| H. H. Gardham & Co., Ltd. | £1,250 |
| H. Base | £1,375 |
| C. Griffiths | £1,315 |
| J. Cashmore | £1,575 |
| **H. Hargrave** (accepted) | **£1,850** |

HACKNEY.—The Electricity Committee reports that the Tudor Accumulator Co., Ltd., has requested the Council to agree to a revision of the contract for maintaining the storage battery, owing to the increased cost of labour and materials :—

The Committee recommends that the contract be amended by the insertion of a clause, whereby the Borough Council agrees to pay at the end of each financial year, in addition to the premium provided for by the agreement, a sum equal to 5 per cent. of the premium for every £1 by which the average of the mean daily quotations of English lead exceed £18 per ton, the increased premium to take effect from April 1st next.

Two additional vertical-spindle circulating pumps, £1,708.—Rees Roturbo Manufacturing Co., Ltd , recommended.

**Liverpool.**—Corporation. Accepted :—

National Electric Construction Co., Ltd., for the renewal and repair, where necessary, of the permanent way of the Liverpool and Prescot light railway, including rails, points, crossings, according to the specification.

**Middlesbrough.**—Corporation. Accepted :—

Three miles H.T. cables, £6,870.—British Insulated & Helsby Cables, Ltd.
Seven 150-K.V.A. single-phase transformers, £2,030.—Metropolitan-Vickers Electrical Co., Ltd.
12 3,000-volt switches, £1,470.—Metropolitan-Vickers Electrical Co., Ltd.
720 yards ·4 × ·4 × ·15 sq. in. cable, £1,240.—British Insulated & Helsby Cables, Ltd.

**Stretford.**—Urban District Council. Accepted :—

5,000-KW. Westinghouse turbine, complete with condensers and accessories, £35,210.—Metropolitan-Vickers Electrical Co., Ltd.

**Wolverhampton.**—Corporation. Accepted :—

Three 300-K.V.A. transformers, £1,617; three 100-K.V.A. transformers, £762. —Brush Electrical Engineering Co.

**York.**—The Corporation received six tenders for the equipment of the power house at the proposed hydro-electric works at Linton Docks, ranging from £52,331 to £107,388. The Electricity Committee has recommended the acceptance of the lowest, a composite one from Messrs. Vickers, Ltd., and Timothy Patrick. The turbines specified in this tender are of the high velocity type and considerably smaller than those quoted for in the next lowest tender, that of the English Electric Co., £64,685. Of the eight tenders received for the necessary cable, ranging from £8,807 to £9,950, the committee recommended the acceptance of the lowest, sent in by Messrs. Vickers, Ltd.

## FORTHCOMING EVENTS.

**International Motor Boat and Marine and Stationary Engine Exhibition at Olympia.**—March 12th to 20th. 11 a.m. to 9 p.m.

**Royal Institution of Great Britain.**—Saturday, March 13th. At Albemarle Street, W. At 3 p.m. Lecture on "Positive Rays," by Sir J. J. Thomson, F.R.S.

**Salford Technical and Engineering Association.**—Saturday, March 13th. At the Royal Technical Institute. At 7 p.m. Informal talk on "Machine Tools, Ancient and Modern," by Mr. T. R. Shaw.

**Birmingham and District Electric Club.**—Saturday, March 13th. At the Grand Hotel, Colmore Row. At 7 p.m. Paper on "Advertising in the Engineering Industries," by Mr. W. E. Warrilow.

**Chief Technical Assistants' Association.**—Tuesday, March 16th. At Anderton's Hotel, Fleet Street, E.C. At 7 p.m. Annual general meeting. Adjourned discussion on Messrs. Bowden and Ingram's paper on "The Design and Equipment of Sub-Stations."

**Institution of Civil Engineers.**—Tuesday, March 16th. At Gt. George Street, S.W. At 5.30 p.m. Lantern exhibition of views taken throughout the war areas in France and Flanders, by Sir A. B. W. Kennedy, F.R.S.

**Royal Society of Arts.**—Wednesday, March 17th. At John Street, Adelphi, W.C. At 4.30 p.m. Paper on "Street Passenger Transport of London," by Mr. W. W. Beaumont.

**Paisley Association of Electrical Engineers.**—Wednesday, March 17th. At 7.30 p.m. At the Y.M.C.A., High Street. Open meeting for discussion.

**Belfast Association of Engineers.**—Thursday, March 18th. At the Municipal Technical Institute. At 7.45 p.m. Paper on "Deve opment of the Belfast Harbour," by Mr. T. S. Gilbert.

**Institution of Electrical Engineers.**—Thursday, March 18th. At the Institution of Civil Engineers, Great George Street, S.W. At 6 p.m. Adjourned discussion on papers read on March 11th.

Informal meeting. Monday, March 15th. At the Institute of Patent Agents, Staple Inn Buildings, W.C. At 7 p.m. Paper on "Industrial Electric Heating," by Messrs. J. W. Beauchamp and S. M. Hills.

(**Liverpool Sub-Centre.**)—Monday, March 15th. At the University, Liverpool. At 7 p.m. Paper on "The Application of the Electric Locomotive to Main-line Traction on Railways," by Lieut.-Col. H. E. O'Brien.

(**South-Midland Centre.**)—Wednesday, March 17th. At the University, Birmingham. Paper on "The Protection of Alternating Current Distribution Systems Without the Use of Special Conductors," by Major R. Edgeumbe, R.E.

(**Wireless Sectional Meeting**).—Wednesday, March 17th. At the Institution of Civil Engineers, Great George Street, S.W. At 6 p.m. Paper on "Duplex Wireless Telephony: Some Experiments on its Application to Aircraft," by Capt. P. P. Eckersley.

**Chemical Society**—Thursday, March 18th. At Burlington House, Piccadilly, W. At 8 p.m. Ordinary scientific meeting.

**Junior Institution of Engineers.**—Friday, March 19th. At 39, Victoria Street, S.W. At 7.30 p.m. Paper on "Shipbuilding and Shipping Developments in Italy," by Mr. W. H. F. Robbs.

**Electro-Harmonic Society.**—Friday, March 19th. At the Holborn Restaurant (Venetian Chamber). At 8 p.m. Smoking concert.

**Association of Engineering and Shipbuilding Draughtsmen.**—Friday, March 19th. At the Y.M.C.A., Bothwell Street, Glasgow. At 8 p.m. Lecture on "Oil Tankers," by Mr. C. R. H. Bonn. At Sheffield University. At 7.30 p.m. Lecture on "Some Steam Economies," by Mr. G. Rowe.

**Institution of Mechanical Engineers.**—Friday, March 19th. At the Institution, Storey's Gate, Westminster, S.W. At 6 p.m. Paper on "Exact Data on the Performance of Mechanical Stokers, as applied to "Lancashire" or other narrow-flued Boilers," by Mr. D. Brownlie.

## NOTES.

**The Isaacs-Norman Controversy.**—Further correspondence in connection with this matter has been published. Mr. Godfrey Isaacs on January 5th informed the Premier that in view of the letters written by Sir Henry Norman, contrasted with his statements in the House of Commons, and in the case of Isaacs v. Hobhouse, he protested against the appointment of Sir Henry as chairman of the Sub-Committee on Imperial Wireless Communications which was set up by the Imperial Communications Committee in November last. Mr. Lloyd George replied on March 3rd that Sir Henry Norman would not resign his chairmanship. Mr. Isaacs informed the secretary of the Imperial Communications Committee on the same date that he could not depute a representative of the Marconi Co. to appear before the Committee so long as Sir Henry Norman was chairman, and the Committee passed a resolution of confidence in the impartiality of the chairman.

Mr. Isaacs, however, sent the Sub-Committee a copy of a memorandum of the scheme which his company recommended, and which it had offered to the Government to carry out.

A long letter from Sir Henry Norman to the Prime Minister was published in the *Times* of March 5th.

**Electrical Trades Benevolent Institution.**—The profit on the reception, supper and dance which was held in Newcastle on December 12th last, has resulted in a contribution being sent to the funds of this Institution of £50. This is in addition to what was collected as subscriptions and donations by the Organising Committee, which is to be much congratulated on its success.

**Electricity Outpaced.**—From the *Electrical Power Engineer* :—The following letter was received by a supply undertaking in the North-East Division. It requires no comments.

Mr.—— 41, Church Street,
Pork Butcher, December 7th, 1919.

Dear Sir,

Enclosed please find cheque for £5 as my contribution towards laying caule to 41, Church Street, and I hope your men will appear as quick as the invoice as (*sic.*) I understand electricity is very quick, but this invoice leaves it stood still, but apart from joking, I hope you will try and get me fixed up this next week.

Yours truly,

**Imperial Wireless Communication.**—Whilst going to press, we have received from Messrs. Marconi's Wireless Telegraph Co. a copy of the memorandum submitted by the company to the Sub-Committee dealing with Imperial Wireless Communications, and of the terms upon which the proposal is submitted. The scheme provides for communication throughout the Empire, independent of submarine cables and land lines (except at terminals), with alternative routes, and automatic transmission at not less than 100 words per minute, with duplex working, and contemplates the admission of foreign traffic, in order that the system may be commercially self-supporting.

The scheme is based upon the establishment of "main trunk" long-distance stations, and "main feeder" transmitting stations, operated from a central control office in each area, and "local feeder" stations, and the use of continuous, or "undamped," waves throughout; the abolition of the timed spark and the arc generator in favour of the high-frequency alternator and the valve; and the use of the Franklin aerial, which, it is claimed, represents "such enormous improvement over previous methods as regards selectivity and avoidance of atmospheric disturbance" that no other system need be considered—with it, signals can be received only from one direction. The concentration of staff at a central control office saves an enormous amount of time and labour; retransmission is entirely eliminated.

Seven trunk routes are suggested, requiring 26 main trunk stations, but roughly it is estimated that 30 main trunk stations, 50 main feeder stations, 100 local feeder stations, and 200 small local stations will be needed.

On this basis the organisation is founded, and maps and tables of personnel (amounting in all to 17,170) are given.

The company offers to construct, maintain, and operate at its own cost the complete network, paying annually to each Government 25 per cent. of the net profits locally earned; the trunk stations to be completed in three years, and the whole system to become the property of the Governments concerned in 30 years, free of cost. The right of purchase at any earlier date is provided for. The company asks for no monopoly.

It is a truly remarkable proposal, and we shall deal with it more fully next week.

**X-Ray Research.**—The Senate of the University of London on February 25th instituted a Chair of Radiology at the Middlesex Hospital, to commemorate the work and sacrifice of the late Mr. C. R. C. Lyster. It is hoped that the new Professor of Radiology will share in developing new methods of diagnosis and treatment of disease, especially with regard to cancer.—*The Times.*

As a permanent memorial to the late Sir James Mackenzie Davidson, who did valuable work in connection with radiology, it is proposed to create an institution for teaching and research. The appeal for funds points out that a diploma in radiology and electrology at Cambridge University has been established, and its success will be greatly assured if similar facilities are provided in London. Contributions should be sent to Dr. Robert Knox, 38, Harley Street, London W. 1.

**The Stalybridge Dispute.**—A circular recently published by the E.P.E.A. gives a *résumé* of the proceedings which have taken place between the Association and the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board. This circular, together with correspondence, has been placed before the recently-formed National Joint Board of Employers and Members of Staffs (Electricity Supply Industry), by the following letter :—

"The E.P.E.A. submit this matter to the consideration of the National Joint Board, for the reason that the Stalybridge Joint Board have refused to hear any evidence on behalf of the men concerned.

"A brief statement of the facts of the case is given in the printed circular attached herewith, and recent events are enumerated in the following correspondence :—

"From the above correspondence it will be seen that the Stalybridge Joint Board are adamant in their determination not to hear any evidence on behalf of the men concerned, neither have the Board, the courage, to submit their case to the judgment of an independent tribunal.

"We submit that this attitude is not only contrary to the spirit of the times, but it is distinctly inimical to this undertaking in particular, and the electricity supply industry.

"We would urge that the National Joint Board should support us in our request to the Ministry of Labour for an inquiry under the Industrial Courts Act, 1919."

The correspondence referred to consists of letters from the Stalybridge engineer-in-chief to the Ministry of Labour, stating that the E.P.E.A. had refused arbitration for its members, and also that since the latter had left a complete new staff had been engaged, and was giving satisfaction ; from the secretary of the E.P.E.A. to the Ministry of Labour stating that the Association had not refused arbitration, and pressing for an inquiry under the Industrial Courts Act. This letter further states that in spite of the Stalybridge engineer's assertions, interruptions of the supply occur almost daily ; from the E.P.E.A. to the Ministry of Labour reporting the refusal of the Stalybridge Board to hear evidence on behalf of the men, and reaffirming the request for an inquiry ; from the Stalybridge Board to the E.P.E.A. stating that arbitration having been refused by the Association, the Board considered the matter closed, and were not prepared to enter into further discussion. Arising out of this dispute is the case of a member of the E.P.E.A., who, in spite of his knowledge of the break between the Association and the Stalybridge Board, has accepted an appointment under the latter as a charge engineer. He has, therefore, been expelled from the Association for what is considered very disloyal action upon the part of a member of a protective association.

**Electricity and Oranges.**—The American *Electrical Review*, in a recent issue, gave some interesting details of the part played by electricity in the orange-growing industry of Southern California. By means of electrically-driven centrifugal pumps wide areas, formerly arid pasture land, have been rendered suitable for the successful growing of oranges and similar fruits. Electricity for this purpose is generated by the harnessing of mountain torrents. When the fruit is picked, electric washers are employed to clean it. Then it is sorted, packed, and labelled, also electrically, even the boxes being made by this means.

**Educational.**—University College, London.—Prince Arthur of Connaught will preside, on March 19th, at a luncheon to be held at the Savoy Hotel, when the proposals for the reconstruction and re-equipment of the engineering laboratories at University College will be explained by the treasurer, Sir Ernest Moir, and others. An appeal for £100,000 towards this object was recently issued, and already over £33,000 has been collected. Further donations should be sent to Prince Arthur of Connaught, at 42, Upper Grosvenor Street. *The Times* states that a number of engineering firms have recently sent donations, including Messrs. Babcock & Wilcox, Ltd., £500 ; the City of London Electric Light Co. and the St. James's and Pall Mall Electric Light Co., £250 each ; and Rolls-Royce, Ltd., and the Sunbeam Motor-Car Co., Ltd., £100 each.

**Freemasonry.**—Nearly 50 members of the Kelvin Lodge of Instruction gathered together at the annual supper at the Restaurant de Boulogne, Gerrard Street, on Friday, the 5th inst., when Mr. J. O. Pearston, the genial Preceptor, occupied the chair, supported by Mr. T. W. Greaves, the W.M. of the Mother Lodge. After the supper, there was an excellent musical entertainment provided by Messrs. Victor Holliday, Sandiford, Buck, Jones, Porter-Cox and other gentlemen, and altogether all present spent a very happy evening.

**The English Glass Industry.**—With regard to the remarkable revival of the English glass trade, a correspondent points out that it was in the manufacture of electric lamp bulbs that the greatest progress was made, and that it was this section of the industry that first reached the position of being able not only to satisfy home requirements, but also to provide a surplus for export. This satisfactory state of affairs was due to the introduction of machinery from America, without which the output would have been quite impossible. Before the war production by machinery in this country was restricted under an arrangement with the manufacturers of several Continental countries, who combined to purchase the European rights of the Owen machine. That arrangement has come to an end, and our own manufacturers, in addition to the Owen machine, have now acquired two other American machines—the Empire and the Westlake. During the last few weeks the latter machine, which requires only a mechanic and two boys to attend to it, produced in an eight-hour shift at Leamington-on-Tyne 24,000 articles for illuminating purposes, while under the old glass-blowing system the weekly output of 180 men was only 500,000. These figures give some idea of the great production of electric lamp bulbs in this country at the present time. The initial difficulties of the machines have now been overcome, and the goods produced are of excellent quality. The peculiarity which will be noticed in the machine-made bulb is the absence of the little glass tip. This tip was made by the workman in closing the exhausted bulb, but the machine rounds off the articles beautifully.

**Two a.m.—A Switchman's Soliloquy.—**

Is't a voltmeter, which I see before me,
The pointer off the scale ? Let me adjust thee :—
I harmed thee not, and yet thou treat'st me ill.
Art thou not, cursed gadget, sensible
To pity, as to load ? or art thou but
A phantom of the night ; a quaint mirage
Proceeding from my sleep-befuddled brain ?
I see thee yet, and now thy finger's poised
Below the zero mark.
Thou mak'st me sweat with fear of my undoing,
And visions of "the sack" curdle my veins.
Mine eyes but make a mock o' the sober reason,
Or else I'm half asleep ; I see thee still ;
And now methinks thou standest on thy head,
Which was not so before.—I do but dream ;
It is th' infernal nightshift, which distorts
Thus commonsense.—Now in the engine room
Some are abed, and snoring loud betrays
The secret sleep ; now others celebrate
With tea and sandwich ; and th' Engineer,
Alarumed by his sentinel, instinct,
Halts in his stride ; then, cursing loud and deep,
With vengeance in his eye, scenting a "cop,"
Moves like a ghost.—Thou slow and laggard clock,
Get thee a move on, and thou canst, for fear
The very log prate of thy sluggishness.
What evil have I done thee then, that thus
Thou driv'st me crazy ? Whiles I fume and sigh,
I think of those who comfortably lie
Safe tucked in bed.—Would that such lot were mine.

*(A bell rings.)*

"Yes, switchman speaking ?" "Volts are down ?"
"Asleep ?"
Some one seems dubious of the watch I keep.
'Tis only two a.m.—ye gods, this life of joy—
I think I'll go and be a farmer's boy.

W. H. S., in the *Electrical Power Engineer*.

**Representation of Staff Members on Joint Boards.**—The *Electrical Power Engineer* in a recent issue states :—"The preliminary Conference called for the purpose of forming a National Industrial Council for the Electricity Supply Industry was held in June, 1918.

"The E.P.E.A., representing the technical engineers on the staffs, were represented at this Conference, but opposition to such representation came from the manual workers' Unions.

"At this period the E.P.E.A. were holding conferences with the representatives of the employers in different parts of the country on the matter of basic rates of remuneration for staff engineers, and had also made a definite claim for a war advance.

"After considerable negotiation at a Conference held on December 12th, 1919, between a Committee of Employers and representatives of the E.P.E.A., it was agreed to form a National Joint Board of Employers and Members of Staffs (Electricity Supply Industry).

"This National Board will deal with all matters connected with the staff members of the Electricity Supply Industry, and will consist of 12 representatives on each side, of the Associations representing the employers and the staffs in the Electricity Supply Industry.

"Sectional Committees are being formed to deal with the affairs of particular sections of the staff, and one such committee consisting of four employers' representatives and four representatives from the E.P.E.A., has been formed to consider a schedule of salaries put forward by the E.P.E.A.

"It is gratifying to record that since the above was written, the Ministry of Labour has officially recognised the joint board, and that already two meetings of the committee have been held, to discuss the salaries schedule."

**Appointments Vacant.**—Telegraph sub-engineer (£200 + £60), for the Posts and Telegraphs Department, Tanganyika Territory ; assistant electrical engineer (£300 + war bonus), for the Dar-es-Salaam electric power plant ; shift engineer (94s. 6d.), for the Glasgow Corporation Electricity Department ; fitter (84s.), for the Borough of Tunbridge Wells Electricity Works ; draughtsman for the Greenock Corporation Electricity Department ; mains engineer (£350), for the City of Coventry Electricity Department ; assistant charge engineer (£354), for the Carville Power Station ; lectureships in mechanical and electrical engineering (£380 + war allowance), for the Birmingham Municipal Technical School ; mains engineer (£250), for the Borough of Torquay Electricity Department ; works superintendent (£300), for the Nelson Corporation Electricity Department ; assistant mains engineer (87s. plus E.P.E.A. awards to date ; plumber-jointer (98s. 3d.), meter fixer (80s. 7d.), for the Stepney Borough Council Electricity Works. See our advertisement pages to-day.

**Lighting Conditions in Mines.**—In a paper on lighting conditions in mines, with special reference to the eyesight of miners, read by Dr. T. Lister Llewellyn before the Illuminating Engineering Society, on February 24th, the subject of the occurrence of miner's nystagmus was considered. Dr. Llewellyn condemned the miner's oil lamp as extremely inefficient; the lighting at the working face is not only bad, but it also falls off seriously towards the end of the shift, and figures show that such poor illumination very seriously affects miners' eyesight. Oil amps, when tested, showed a power of 0·50 Hefner unit at the beginning of the shift, deteriorating to 0·28 at the end, compared with electric lamps showing 1·75 units to 2 units at the start, and 1·5 units to 1·75 units at the end. Acetylene lamps showed no deterioration. The effect of this on eyesight is reflected in the following statistics. With oil lamps the number of grave cases of nystagmus per 10,000 was 35, and of serious cases 57. The number of cases as a percentage of the workers on day shift was 31. This percentage was reduced in the case of electric lamps to 15·4, of which the grave cases were only 8 per 10,000. Evidence showed that the introduction of the electric lamp had enabled scores of miners to continue at work underground. In two similar pits, after electric lamps had been introduced into one of them the cases of nystagmus had been greatly reduced in the pit which had adopted electric lamps of 0·62 c.p., compared with oil lamps of 0·25 c.p. These lamps gave respectively 0·023 ft.-candle and 0·015 ft.-candle at the face. The men with electric lamps turned out 5 per cent. more than those with oil lamps, while the shifts lost from accident were 1 in 54 with the electric lamps against 1 in 23 for the oil lamps. The cost of an oil lamp was put at 3½d. per week, while the electric lamp was said to cost ½d. to 1d. more, though figures were given claiming it to be actually cheaper at some collieries. The electric lamp was more expensive as regarded first cost. In a contribution to the discussion, Mr. Elworthy pointed out that it was the light reflected from the coal face which affected the miner. To give relief it had been suggested to colour-wash the roof, &c., and where this had been experimentally attempted considerable relief had been experienced.

**The Cost of Petrol.**—The Automobile Association and Motor Union is organising a petition to the Prime Minister, urging that legislation shall be at once introduced to ensure the immediate production of benzole and power alcohol in large quantities. Everyone is directly affected by the price of motor fuel, and we earnestly commend the petition to the attention of our readers. Particulars can be obtained from the Secretary of the Association, Fanum House, Whitcomb Street, London, W.C. 2.

**Electro-Harmonic Society.**—The last smoking concert of the season will be held at the Holborn Restaurant, in the Venetian Chamber, on Friday, March 19th, commencing at 8 p.m. Chairman, Mr. Hugo Hirst. Artistes:—Mr. John Collett, tenor; Mr. Robert Howe, baritone; Mr. Spencer Dyke, violin; Mr. Louis Nikola, magician-entertainer; Mr. J. M. Campbell, Scotch humorist; Mr. Will Bentley, humorist; Mr. Norman Long, entertainer at the piano; Mr. Bernard Flanders, A.R.A.M., pianoforte solo and accompanist.

## INSTITUTION NOTES.

**Institution of Electrical Engineers.**—On Thursday, last week, the annual dinner of the Institution was held at the Connaught Rooms, Kingsway, London; Mr. Roger T. Smith, president, was in the chair, and there was a record attendance of 410 members and guests. The guests of the Institution included the Dean of Westminster, General Sir C. F. N. Macready, Rear-Admiral Sir W. C. M. Nicholson, Sir Sidney Chapman, Sir Gregory Foster, Sir G. E. P. Murray, Lieut.-Col. Sir F. Younghusband, Major-Gen. G. D. Jeffreys, Col. O. C. Armstrong, Dr. S. Russ, Sir Frank Heath, Prof. W. H. Bragg, Sir Chas. Parsons, Rear-Admiral F. L. Field, Capt. A. K. Waistell, Prof. J. E. Petavel, Messrs. S. C. Aldington, W. W. Lackie, Stanley Machin, W. Noble, A. P. Trotter, H. A. Payne H. Booth, E. Guy Dauber, A. Page, T. Roles, H. F. Carlill, G. C. Lloyd, C. D. le Maistre, John Gray, E. Raven, G. W. Humphreys, and A. Hurst; and among the members present were Messrs. W. M. Mordey, Ll. B. Atkinson, G. W. Partridge, J. S. Highfield, J. Devonshire, Dr. W. H. Eccles, Capt. H. Riall Sankey, Messrs. S. E. Fedden, P. D. Duckett, H. J. Cash, J. Sayers, A. Carpmael, W. M. Selvey, D. N. Dunlop, C. T. Allan, C. H. Wordingham, Col. H. C. Sparks, Dr. C. C. Garrard, Messrs. A. P. M. Fleming, C. C. Paterson, B. Welbourn, H. W. Clothier, P. R. Allen, and Mr. P. F. Rowell, secretary.

During the evening messages of greeting were read by the president from the sister societies in Italy and the United States.

After the loyal toasts had been honoured, Sir Gregory Foster proposed "The Institution of Electrical Engineers," pointing out that it dated its origin from the year 1871, a year big with the world's destiny, of which we had learnt the fruits during the past five years. After making the welcome announcement that Prof. Fleming was recovering from his recent illness, he referred to the wonderful record of electricity, which he attributed in great part to co-operative industry and team work, and emphasised the need for the better organisation of research in this country, which the Government had recognised by the establishment of the Department of Scientific and Industrial Research during the war.

The President, responding, said that scientific training was of the first importance to the electrical industry, and drew attention to the scheme for the rebuilding and re-equipment of the engineering department at University College, London. The Institution this month, he said, would attain a membership of 8,800, which was greater than that of any other engineering society in this country; and next year it would celebrate its fiftieth birthday. Welcoming the newly-appointed Electricity Commissioners (of whom the chairman, Sir John Snell, was, unfortunately, prevented from attending the dinner), Mr. Smith expressed the hope that the Institution would be able to assist in carrying out the provisions of the Electricity Supply Act, and that its administration would bring about the benefits intended—an abundant and *cheap* supply of electrical energy. In the recent history of the Institution, the most interesting feature was the decentralisation of some of its activities by the formation of Territorial Centres and Sub-Centres, of which there were now 12 in all, in addition to the Centres abroad—a natural development which was wholly beneficial. The parent body in London was delighted with the vigour and enthusiasm of these local bodies; happy in the stored traditions of half a century, it was amused at the suggestion that London should become a Centre—there were 3,000 members within its radius, equal to the whole of the Centres and Sub-Centres put together. Centres cost money, and when the Institution returned to its home, the great difficulty that would at once arise would be a financial one. Outside the Institution, the essential need was industrial peace, and the key to that, he believed, was "service"; until the idea of service replaced that of self-interest, there would never be peace in this country.

Mr. Ll. B. Atkinson, proposing "The Guests," and referring to their respective claims to distinction, laid stress on the supreme importance of industrial research, and stated that the industrial association formed by the Institution and the B.E.A.M.A. was approaching the stage of recognition by the Research Department. The whole industry was unanimous in approving of the establishment of a Board of Electricity Commissioners to guide the Government and assist the industry; welcoming the Commissioners who were present, he said that the Board would command the confidence of electrical men, and that if mistakes were made, they would be due not to the advice that was given, but to the perversity of politicians. The Overseas Department was doing very useful work, though it had started at an unfortunate time, when the home markets fully occupied the attention of manufacturers; it also had to live down a past of Foreign Office contempt of traders. The Board of Trade also had to live down a past, so far as trade was concerned; it had looked after trade, indeed, but any kind of trade—what they were interested in was British trade, not that of their competitors, and the Board of Trade, in the past, had sought to encourage imports, leaving the rate of exchange to look after the exports. Lenin had advocated wholesale electrification in Russia on the Soviet principle; if capitalists had not been extirpated in this country, many of them had extirpated their capital.

Responding, General Sir C. F. N. Macready said that it was necessary for all citizens to come forward in times of stress and do their bit; men who were not technically trained should join the special constabulary. He referred to the fact that 2,000 members of the Institution had been engaged in war service, and that their late president had been called in to assist in reorganising the Royal Engineers.

Lieut.-Col. Sir F. Younghusband also replied on behalf of the guests.

The members then adjourned to the reception room, according to custom, for a reunion. During the evening a programme of music was performed by the British Imperial Orchestra, and the arrangements were in every way conducive to the success of this, the most important annual function of the Institution.

**Institute of Metals.**—The report of the Council for the year ended December 31st, 1919, presented at the twelfth annual general meeting on March 11th, announces that the membership has reached a total of 1,213. The death of Sir William Crookes, O.M., F.R.S., an honorary member of the Institute, is mentioned. The body of the report is devoted to the proceedings, &c., of Special Committees. A deficit of £470 on the year is estimated, and an increased subscription is considered necessary.

**Physical Society of London.**—At the meeting held on February 27th, a paper, entitled "Notes on the Testing of Bars of Magnet Steel," by Dr. N. W. MacLachlan, was read. The paper described the results of experiments with the Ewing double permeameter. It was shown that the assumption underlying the theory of the method—viz., that the end effects were the same with the long and short bars—was not justified, and that the value of H, as found by calculation on this assumption, was in error. The error did not, however, exceed 1 per cent. for any of the bars tested; but the author concluded that the method was inferior as regarded accuracy and convenience to the differential coil method.

**Institution of Civil Engineers.**—The following series of meetings has been arranged, with a view to placing before the Institution some account of the engineering work done in the war, and the part taken by civil engineers therein:—Tuesday, March 9th, "Royal Engineer Work in the Great War," by Major-General Sir G. W. Heath, K.C.M.G., &c. (late Engineer-in-Chief of the British Armies in France). Tuesday, March 16th, lantern exhibition of views taken throughout the war areas in France and Flanders by Sir Alex. B. W. Kennedy, LL.D., F.R.S. Tuesday, March 23rd, "The Work Done by Railway Troops in France during 1914-19," by Colonel David Lyell, C.M.G., &c. Tuesday, April 13th, "Richborough Military Transportation Depôt," by Lieut.-Colonel J. Ker-Robertson, and "The War Department Cross-Channel Train-

Ferry," by Major F. O. Stanford, O.B.E. Royal Engineer officers and ex-officers will be welcomed at these meetings, and cards of invitation will be issued to them on application to the secretary.

The twenty-sixth "James Forrest" lecture will be delivered at the Institution on April 20th, at 5.30 p.m., by Sir Dugald Clerk, K.B.E., F.R.S., M.Inst.C.E., the subject being "Fuel Conservation in the United Kingdom."

**Birmingham University.**—The value of X-rays in the examination of metals to detect flaws was dealt with by Major J. Hall-Edwards, in a lecture at Birmingham University on March 2nd. Blow-holes and cracks, he said, had been detected in aluminium, steel, and iron up to 6 in. in thickness, and in strips and castings of brass and copper up to 1 in. thick. Captain Knox and Major Kaye had done excellent work in the examination of timber, and X-rays had been used with great success in the examination of car and cycle tires. Another important application of the rays to practical engineering was the examination of ferro-concrete.

**Junior Institution of Engineers.**—At a meeting of the Institution held in London on February 20th, a lecture on "Some Obscure Points in the Theory of the Internal Combustion Engine" was delivered by Prof. F. W. Burstall, M.Sc., M.A.

## OUR PERSONAL COLUMN.

*The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.*

THE ELECTRICITY COMMISSIONERS.—With the appointment of Sir HARRY HAWARD, whose portrait is given herewith, the Board of Electricity Commissioners is completed; now the word is "Full steam ahead!" Sir Harry Haward, as Comptroller since 1893 of the London County Council, in whose service he has been for over 38 years, has acquired that knowledge of affairs which qualifies him to assist the engineer Commissioners in connection with

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SIR HARRY HAWARD.

legal, commercial, and financial questions. In a report of the General Purposes Committee, just issued, his merits are eulogised, and the greatest regret is expressed at his leaving the Council's service, to enter a wider sphere of usefulness. The committee recommends that he be granted a retiring allowance of £1,206 a year, to commence on his leaving the Government service after attaining the age of 60 years. He will take up his duties on April 1st.

The Birkenhead T.C. is recommended to increase the salary of the electrical engineer, Mr. G. P. SHALLCROSS, from £500 to £600 a year, as from February 1st.

Subject to his agreeing to stay with the Corporation for three years, the salary of Mr. OWEN, electrical engineer to the Wigan Corporation, has been increased from £650 to £850 per year, with house, fuel and light, from April 1st next, this to be increased to £1,000 per annum a year later.

Sir AUCKLAND GEDDES, having been appointed British Ambassador to Washington, will not return to McGill University. A *Times* dispatch says the governors intend, if possible, to secure a Canadian as Principal.

MR. C. G. D. JACKSON, general manager's assistant of the Liverpool Corporation tramways, has been appointed assistant general manager, and Mr. H. I. PALMER, chief traffic superintendent, to take full charge of the traffic department.

Mr. J. H. STORRIE, district manager for the York district of the Post Office telephones, has been transferred to Aberdeen.

Mr. D. J. BARNES has been appointed district manager of the York Post Office telephones. He has held a similar position at Blackburn. Mr. Barnes entered the service of the National Telephone Co., Ltd., in 1887.

Mr. E. F. W. ALEXANDERSON, consulting engineer of the American General Electric Co., has recently been the recipient of two marks of appreciation for the services rendered by him in radio research. He has been elected chief engineer of the recently formed Radio Corporation of America, and in addition has been awarded a gold medal by the Institute of Radio Engineers, of which he is a vice-president. Mr. Alexanderson is the inventor of a great deal of wireless apparatus, including a high frequency alternator, a magnetic amplifier, multiple-tuned antennæ, and a barrage receiver all of which are to be used in the 16 stations to be installed by the Radio Corporation in its comprehensive scheme.

Mr. E. P. BENNETT now holds the position of secretary and sales manager to Messrs. Simplex Conduits, Ltd., Garrison Lane, Birmingham. Mr. Bennett has held a number of positions in the company, including that of manager for Liverpool and also for London and the South of England. He has had a long experience in the electrical business, both in England and America, and was connected with well-known contractors in London and the provinces prior to joining the Simplex Co. During the war Mr. Bennett held a technical commission in the R.A.F. Immediately after the conclusion of hostilities he undertook an extended tour, covering most of the European countries, studying the possibilities of the markets for electrical commodities. His observations relating to Switzerland and Italy were published in the ELECTRICAL REVIEW last year.

The Accrington Corporation has decided to apply the civil service arbitration award to the tramways manager and the electrical engineer.

The Southwark Borough Council is increasing the salary of the electrical engineer from £400 to £745 per annum.

Mr. W. W. FIRTH, mains superintendent, Dewsbury Corporation electricity department, has been presented by the staff with a mahogany plant-stand and a pair of vases on the occasion of his marriage.

The Glasgow Tramways Committee recommends that Mr. G. C. BRAID be appointed deputy chief engineer, at £800 per annum, inclusive of all bonuses (present salary £500 inclusive), and that Mr. J. MACDONALD be appointed chief electrical assistant, at £500 per annum, inclusive of all bonuses (present salary £347 inclusive).

Mr. A. P. TROTTER, of Messrs. Handcock, Dykes & Trotter, is retiring from the firm as from March 25th, but will continue to give attention to his special subjects in engineering and science from his new address, Greystones, Teffont, Salisbury, Wilts.

Mr. H. W. WOODCOCK, late of the Rotherham Corporation Electricity Supply Department, has been appointed assistant engineer to the River Plate Electric Co. at their works at La Plata, Argentine. There were 70 applicants.

Owing to the continued ill-health of Mr. DOUGLAS A. BROWN, consequent on his service in the East during the war, he has been ordered by the doctor to live abroad for some years, and the partnership between Mr. Harold Couzens and himself (Couzens & Brown) has accordingly been dissolved. Mr. Harold Couzens will continue to carry on the practice at 9, Old Queen Street as heretofore.

**Obituary.**—PROF. H. S. CARHART.—We regret to record the death, at Pasadena, California, on February 12th, of Prof. Henry Smith Carhart, of the California Institute of Technology. He was ill for only a few hours, and the cause of death was cerebral hemorrhage. Prof. Carhart, who was 76 years of age, went from Harvard in 1881 to the University of Berlin, where he did research work in the laboratory of Prof. von Helmholtz. In 1893 he was chosen by the International Electrical Congress as one of a commission of three to formulate the details of the standard Clark cell. In 1886 he became professor of physics at Michigan University. He later became an expert of world repute on voltaic cells, and in recognition of his eminence in this particular direction he was made president of the American Electrochemical Society. He was a member of the International Jury of Awards at the Paris Exhibition of 1881, and was also a judge at subsequent great exhibitions at Chicago, &c. He was U.S. delegate at the Electrical Units Conferences at Berlin in 1905 and in London in 1908. He was a well-known author of books on physics. Dr. Carhart designed and established the first Physical Laboratory, and later developed the electrical engineering department at the State University of Michigan, where he was Professor of Physics until his retirement therefrom. He was well known in this country, where he took a very prominent part in scientific public life. A correspondent writes: "He was a man of a very lovable disposition that endeared him to all who had the pleasure of his acquaintance."

MR. C. G. GUMPEL.—We regret to record the death, which occurred on March 5th, at Beckenham, of Mr. Carl Godfrey Gumpel, who was formerly well known in the electrical industry.

## NEW COMPANIES REGISTERED.

**Rashleigh Phipps & Co., Ltd.**—Correction: For W. A. Edelstein (see Elec. Rev., March 5th, p. 309) read W. A. Edelsten. All the directors of the company are British.

**Read & Partners, Ltd.** (164,776).—Private company. Registered March 3rd. Capital, £20,000 in £1 shares ((10,000 preferred). To carry on the business of consulting, electrical, mechanical, gas, hydraulic, sanitary, and general engineers, &c. The subscribers are: H. J. Read, Lismore, Alma Road, St. Albans, electrical engineer; H. J. Butcher, 66, Broomfield Avenue, Palmer's Green, N.13, electrical engineer. The first directors are: H. J. Read (chairman), H. J. Butcher, W. J. Bransom, and D. Dunham. Qualification £500. Registered office: 71, Caversham Road, Reading.

**Bourne End and District Electricity Corporation, Ltd.** (164,689).—Private company. Registered March 2nd. Capital, £50,000 in £1 shares. To take over the business of the Bourne End Electric Installation Co., Ltd., and the business of a supplier of electric light and energy lately carried on at Bourne End by T. G. Lunnon, to acquire certain property for extending the said businesses, to adopt an agreement with H. S. Dennington, &c. The subscribers (each with one share) are: R. S. Taylor, 14, Cavendish Mansions, Portland Place, W., manufacturer; E. W. Lean, 1, Whitehall, Ray Park Avenue, Maidenhead, C.A. The first directors are: R. S. Taylor, E. W. Lean, and H. S. Dennington. H. S. Dennington may retain office while holding £10,000 shares. Solicitors: A. E. & G. Tooth, 37, Lincolns Inn Fields, W.C.

**A.B.C. Manufacturing Co., Ltd.** (10,993).—Private company. Registered in Edinburgh, February 20th. Capital, £5,000 in £1 shares. To carry on the business of electrical, mechanical, and motor engineers, iron and brass founders, tinplate makers, &c. The subscribers (each with one share) are: J. Anderson, 144, Kenilworth Avenue, Shawlands, Glasgow, contractor; A. B. Campbell, 302, Cross Road, Glasgow, engineer. The first directors are: J. Anderson, A. M. Anderson, 121, York Drive, Hyndland Glasgow; J. J. Christoe, Balgownie, Westwood Avenue, Giffnock; and J. W. Lynhurst, 32, Linn Terrace, Muirend, Cathcart, Glasgow. Qualification £100. Registered office: 14, Douglas Street, Glasgow.

**Electrical & General Sundries, Ltd.** (164,619).—Private company. Registered February 28th. Capital, £500 in £1 shares. To carry on the business indicated by the title. The provisional directors are: H. W. Cole, 114, Trinity Road, Upper Tooting, S.W.17, electrician; Evelyn Whittle, 23, Stirling Road, Clapham Rise, S.W.9, clerk. Secretary, Evelyn Whittle. Registered office: 14, Victoria Street, Westminster.

**International Automatic Telephone Co., Ltd.** (164,393).—Registered February 23rd. Capital, £920,000 in £1 shares (300,000 preferred, 300,000 ordinary, and 300,000 deferred). To acquire (1) all or any of the shares or securities, and all or any of the assets and liabilities of the Automatic Telephone Manufacturing Co., Ltd., and any other company, whose objects include the business of manufacturers of or dealers in automatic or other telephones, telegraphs, or other electrical contrivances or apparatus connected therewith, and (2) licences from the Automatic Electric Co., of Chicago, to operate, use, and exercise in Europe and elsewhere inventions relating to such contrivances or apparatus, &c., and to adopt an agreement with T. G. Frank, H. Woods, A. F. Adams, H. L. Gary, J. B. Russell, J. Taylor, and D. Sinclair. The subscribers (each with one share) are: G. Dickson, 4, London Road, Benfleet, clerk; E. J. Alldis, 12, Macdonald Road, Forest Gate, E., clerk; and five other clerks. Minimum cash subscription 7 shares. The subscribers are to appoint the first directors. Solicitor: H. H. Atteridge, 2, Bond Court, Walbrook, E.C. Registered office: Royal Liver Buildings, Liverpool.

**Solar Electrical Co., Ltd.** (164,727).—Private company. Registered March 2nd. Capital, £2,000 in £1 shares (1,000 10 per cent. preference). To carry on the business of electrical engineers, electricians, dealers in electrical apparatus, &c. The first directors are: L. S. Challis, 6, Dungarvon Avenue, Putney, S.W.; E. Kilpin, 14 and 15, Conduit Street, W. Registered office: 53, Haymarket, S.W.

**A. C. Sparking Plug Co., Ltd.** (164,744).—Private company. Registered March 2nd. Capital, £20,000 in £1 shares. To acquire from the Champion Ignition Co., of Flint, Michigan, U.S.A., the concessions, patents, patent rights and trade marks of the A.C. Sparking Plug, and the business therein for any of the following countries: U.K., Holland, Belgium, Denmark, Norway, Sweden, Finland, and any other country in the Eastern Hemisphere, and any British Colony or dependency. The subscribers (each with one share) are: R. A. Chalmers, 37, Craven Terrace, W.2, engineer; A. Peters, 4, Mount Road, Wimbledon Park, S.W.19, solicitor's clerk. The subscribers are to appoint the first directors. Qualification 100 shares. Solicitors: Rehneth Brown, Baker, Baker, Lennox House, Norfolk Street, W.C.2.

**Hesco, Ltd.** (164,790).—Private company. Registered March 3rd. Capital, £10,000 in £1 shares. To carry on the business of mechanical, electrical, aeronautical, and general engineers, electricians, &c., and to adopt an agreement with H. E. Spencer. The subscribers (each with one share) are: G. T. Little, 7, Dorncliffe Road, Fulham, S.W., clerk; A. Hall, Parkland Grove, Ashford, Middlesex, solicitor. The subscribers are to appoint the first directors. Solicitor: A. Barrie, 1, Church Court, Clements Lane, E.C.

**J. Hopkinson & Co., Ltd.** (164,767).—Private company. Registered March 3rd. Capital, £600,000 in £1 shares (250,000 preference). To carry on the business of mechanical and electrical engineers, machine and engineering tool makers, manufacturers of boilers, flues, boiler mountings and fillings, electrical, hydraulic, and pneumatic apparatus, &c., to acquire the business of J. Hopkinson & Co., Ltd. The subscribers (each with one share) are: A. H. Hopkinson, Copt Hill Court, Bargh Heath, Tadworth, Surrey, engineer; L. H. Hopkinson, Cleveland House, Huddersfield, engineer. The first directors are: A. H. Hopkinson, L. H. Hopkinson, R. Kilburn, and F. Murgatroyd (ordinary directors), J. H. Hanson (representing "A" shares), and R. V. Bigby (representing "B" shares). Holders of preference shares No. 1-134,563 and ordinary shares No. 1-12,456 ("A" shares) and holders of preference shares Nos. 134,564-350,000 and ordinary shares Nos. 124,564-250,000 ("B" shares) have the right to appoint a director as representative of the "A" and "B" shares respectively. Solicitor: W. Ramsden, Station Street Buildings, Huddersfield.

## OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

**Westinghouse Morse Chain Co., Ltd.**—Mortgage on factory, Works Road, Letchworth, registered February 10th, 1920, to secure all moneys due or to become due from company to Barclays Bank.

**Enfield Ediswan Cable Works, Ltd.**—Debenture dated February 17th, 1920, to secure £40,000 charged on the company's undertaking and property, present and future, including uncalled capital, subject as to certain freehold land with buildings thereon to a prior charge for £60,000 ranking *pari passu* therewith. Holders: London County Westminster and Parrs Bank, Ltd., 21, Lombard Street, E.C.

**Trafford Power & Light Supply (1902), Ltd.**—Satisfaction in full on February 17th, 1920, of mortgage debenture dated March 30th, 1910, securing £25,000.

**Hart Accumulator Co., Ltd.**—Debentures for £40,000, registered February 11th, 1920, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: London County Westminster & Parrs Bank.

**Switchgear & Cowans, Ltd. (formerly Switchgear and Cowans (1911), Ltd.**—Satisfaction registered February 11th, 1920, of charges for £250, registered April 14th, 1913, and £2,350, registered February 11th, 1920. Issue registered February 11th, 1920, of £2,350 "B" debentures, part of a series of £3,000 already registered.

**Implitico, Ltd.**—Return dated November 17th, 1919. Capital, £3,000 in £1 shares. All shares taken up and paid for in full. Mortgages and charges: Nil.

**India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd.**—Return dated January 1st, 1920. Capital, £822,000 in £10 shares (50,000 ordinary, 25,000 preferred, and 6,200 unclassified), 50,000 ordinary and 25,000 preferred shares taken up. £750,000 paid. Mortgages and charges: £400,000.

**Lamp Manufacturing Co., Ltd.**—Return dated February 9th, 1920. Capital, £10,000 in £1 shares. 5,400 shares taken up. £5,400 paid. Mortgages and charges: £2,500 debentures.

**Yorkshire (West Riding) Electric Tramways Co., Ltd.**—Return dated February 14th, 1919 (filed February 19th). Capital, £600,000 in £5 shares (70,000 preferred and 50,000 ordinary), 46,261 preferred and 40,977 ordinary shares taken up. £436,190 considered as paid. Mortgages and charges: £272,373.

**Tilney Manufacturing & Testing Co., Ltd.**—Debentures for £1,000, registered February 13th, 1920, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: M. J. E. Tilney, The Knowles, Watford.

**C. H. Hare & Son, Ltd.** (110,911).—Capital, £16,000 in 8,000 preference and 8,000 ordinary shares of £1 each, of which, to December 31st, 1919, 6,200 preference and 8,000 ordinary had been taken up. £6,702 paid on 6,200 preference and 502 ordinary. £7,498 considered as paid on the remaining ordinary. Mortgages and charges, nil. The Lamson Paragon Supply Co., Ltd., holds a large block of shares.

**Electrical Contracts & Maintenance Co., Ltd.** (101,757).—Capital, £3,000 in £1 shares. Return dated December 18th, 1919. All shares taken up. £1,331 paid. £1,669 considered as paid. Mortgages and charges: £10,000.

**Ferranti, Ltd.** (83,718).—Capital, £130,000 in 60,000 preference, 60,000 ordinary, and 10,000 deferred shares of £1 each, of which, to December 19th, 1919, 53,374 preference, 60,000 ordinary, and 10,000 deferred had been taken up and credited as fully paid. Mortgages and charges: £110,785.

**East India Tramways Co., Ltd.** (74,457).—Capital, £100,000 in 15,000 preference, 35,000 ordinary, and 50,000 deferred shares of £1 each, of which, to December 30th, 1919, 7,476 preference, 33,433 ordinary, and 50,000 deferred had been taken up. £7,483 paid on 7,476 preference and 7 ordinary. £83,426 considered as paid on the remainder. Mortgages and charges: Nil.

## CITY NOTES.

**Charing Cross, West End and City Electricity Supply Co., Ltd.**

*West End Undertakings.*—Gross earnings for 1919 £265,856, against £193,858 for 1918; expenses, excluding depreciation, £167,242, against £132,946; net earnings £98,614, against £60,912. Including £162 brought forward and interest accrued £5,056, the available total is £103,832. Out of this debenture interest absorbs £17,829, and there is set aside for depreciation £22,000; preference dividend for the year £18,000; ordinary dividend 7 per cent. for the year £28,000; to general reserve £10,000; leaving to be carried forward £8,002. There are now connected to the West End mains the equivalent of 775,563 (30-watt) lamps: Lighting 459,809, heating 80,777, power 234,977 (9,449 H.P.).

*City Undertaking.*—Gross earnings for 1919 £331,323, against £238,075; expenses £273,722, against £199,250; net earnings £57,601, against £38,825. Including £9,075 brought forward, the available total is £66,676. Out of this, interest on debentures, loans, and advances absorbs £31,458, leaving £35,217. Preference dividend £18,000; to general reserve £10,000; carried forward £7,217. There are now connected to the City mains the equivalent of 851,515 (30-watt) lamps: Lighting 334,925; heating 120,323; power 396,267 (15,936 H.P.). The report contains references to the Electricity Supply Bill in the same terms as were used in the Westminster report (Elec. Rev., February 20th, p. 345).

*West End Undertaking.*—Units generated, 723,704; bought, 16,804,856; units sold, 12,649,228; used on works, &c., 4,879,332.

*City Undertaking.*—Units generated, 41,178,630; sold, 34,349,326; used on works, &c., 6,829,304.

**Underground Electric Railways Co. of London, Ltd.**

Lord Ashfield, presiding at the annual meeting on March 5th, reviewed the financial position of the company, and said that the result was as disappointing as it was unexpected. In the first half of 1919 the gross receipts of the operating companies increased faster than the expenses, and they were thus able to increase their interim dividends, and in consequence their payments to this company, but in the second half the expenses increased much faster than the gross income, and since the close of the year expenses had still continued to rise. The return upon the capital of the London underground railways had during the lifetime of this company averaged only 3.3 per cent. It could not be argued that there had been any profiteering. If those railways had to be built to-day it would cost much more than twice their present capital to build

them. They were at the moment inadequate for the traffic which needed to be carried. There were essential improvements needed, and they were ready to go ahead with the full programme of important extensions and improvements immediately, at an estimated cost of £6,000,000, but until the position was altered it was hopeless to contemplate raising such a sum. The £6,000,000 was only the beginning; it would only produce additions to and improvements of existing railways, whereas in his judgment London urgently needed, and must have before long, entirely new underground railways, including at least one, probably two, high-speed lines. How and where these new railways should be constructed would need long and careful consideration. The crucial question was not construction and location, however, but how the required money was to be raised. The speaker went on to refer to the Bills that the companies were promoting in Parliament dealing with extensions and the increasing of fares. They were asking for power to charge 2d. per mile and for the abolition of workmen's fares. If the undertakings were not put on a self-supporting basis the only alternative was that London traffic should be subsidised either out of national taxation or out of local rates.

**Oxford Electric Co., Ltd.**

Sir Henry Mance, presiding at the annual meeting, referred to the effect of the removal of restrictions and the return to normal conditions. There was an increase of nearly 25 per cent. in business, enabling them to recover lost ground and to submit a satisfactory balance sheet. They believed that this very satisfactory increase would be maintained; the prospects for the future were highly encouraging. After referring to the increased costs, the chairman explained the main outline of the Electricity Supply Bill. He did not think the Bill was likely to affect them to any material extent for many years, as Oxford was not a manufacturing centre, and generating stations were rather scattered. If superstations could supply them with current as cheaply as they could make it they would be very glad to take it from them. If the company retained the distributing part of the system, either independently or in amalgamation with other undertakings, their tenure would probably be established in perpetuity. They proposed to call the shareholders together in the near future to sanction either an increase in capital or an increase in the rate of interest on the preference capital that had not yet been issued. There might have to be some delay in connecting up new consumers, as it was impossible to get delivery of the necessary materials. The boom was likely to continue until the industrial world had made up its leeway. At present it appeared to him that most manufacturers had at least six months' work ahead of them. He hoped that electric lighting installations would be put into all the new houses now being erected throughout the kingdom. The report of the chief engineer (Mr. F. H. Francis) showed that the increased demand had necessitated more plant. They had secured an existing high-speed engine which would ensure their position for the winter, and orders had been placed for an additional alternator and two boilers, which were due before next winter.

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**South London Electric Supply Corporation, Ltd.**—Capital expended during 1919 £9,210. Balance from revenue, less costs, £40,879; interest on investments and sundry receipts £2,111. Including the amount brought forward there is available £46,258. Debenture and other interest £6,880; depreciation £8,000; general reserve £2,500; written off leasehold account, &c., £667; 6 per cent. on cumulative preference shares; dividend on the ordinary shares 6 per cent. for the year. Balance carried forward £10,810, against £3,717 brought in. Mr. H. B. Renwick has become chairman and managing director in place of Mr. Braithwaite resigned. Sir E. Wyldbore-Smith has been appointed a director. Applications received during the year equivalent to 2,351 KW. (total 18,083 KW.). Units sold 7,565,639, increase 453,387.

**Bournemouth & Poole Electricity Supply Co., Ltd.**—Capital expended during 1919 £9,473. Available revenue, including £1,299 brought forward, £38,573. Debenture and loan interest £7,640; leasehold and special redemption funds and interest £2,293; to reserve for depreciation £8,000. Dividends on the 4½ per cent. and 6 per cent. preference shares are paid, and a total of 6 per cent. on the ordinary, leaving £4,628 to carry forward. Total applications 14,291 KW.; increase 1,695 KW. Units sold 4,680,347.

**British L. M. Ericsson Manufacturing Co., Ltd.**—Net profit for 1919 after charging £12,582 for depreciation, £12,616 for income tax, and £2,500 for debenture interest was £25,877, plus £51,279 brought forward. Dividend of 10 per cent., free of tax, on the ordinary shares. Reserve £10,000, to reserve for depreciation of investments £2,500, £48,65 6is carried forward subject to excess profits duty.

**Tyneside Electrical Development Co.**—For the year ended January 31st the profit was £4,533, plus £815 brought forward. Dividend 6 per cent. per annum on preferred ordinary; 10 per cent. on deferred ordinary; to general reserve £1,000; carried forward £849.

**Stewarts & Lloyds, Ltd.**—Dividend for 1919 2s. per share and a bonus of 6d. per share on the deferred shares. £100,000 to general reserve, £10,000 to employés' benefit reserve. Carried forward £100,000.

**Automatic Telephone Manufacturing Co., Ltd.**—The report for 1919 states, says the *Financial Times*, that the profit amounts to £15,724, plus £11,281 brought forward. Directors' fees absorb £2,664, depreciation on patents, &c., £3,000, and dividend on preference shares £12,000, carrying forward £9,341. The directors regret that the profits for the year will not allow of a dividend being paid on the ordinary shares. The decrease in profits is due chiefly to reduction of estimated profits on all the company's manufactures sold and delivered during the greater part of the year, due to the gradual inflation in labour rates and raw material prices, and to reduction of output, due to the Government placing no orders for automatic telephone equipment during the period under review. The reduction of output was further accentuated as regards the general manufactures of the company owing to the impossibility of obtaining delivery of the necessary raw materials in sufficiently large quantities to ensure economical production and to other difficulties encountered in reorganising the factory after the special war work on which the company has been engaged. In the light of these facts, the directors felt that advantage should be taken of the offer submitted to shareholders in a circular letter dated February 7th, 1920, and as holders of a majority of the shares have agreed to exchange their shares on the terms set forth in that letter the new company has been formed and all other necessary steps taken to complete the transaction.

**Stock Exchange Notices.**—Application has been made to the Committee to allow the following to be officially quoted:—

Petters, Ltd.—112,500 ordinary shares of £1 each, fully paid; and 200,000 7½ per cent. cumulative preference shares of £1 each, fully paid.

The committee has specially allowed dealings in the following securities under Temporary Regulation 4 (3):—

General Electric Co., Ltd.—1,600,000 7½ per cent. cumulative "B" preference shares of £1 each, 7s. 6d. paid, Nos. 1 to 1,600,000; and 400,000 ordinary shares of £1 each (issued at 28s., of which 7s. 6d. is paid), Nos. 1,225,001 to 1,625,000, after issue of allotment letters.

Mann, Egerton & Co., Ltd.—48,793 ordinary shares of £1 each, fully paid, Nos. 11,208 to 60,000, and 21,832 preference shares of £1 each, fully paid, Nos. 83,064 to 104,895.

Waygood-Otis, Ltd.—40,000 ordinary shares of £1 each, 5s. paid, Nos. 250,001 to 290,000, after issue of allotment letters.

The committee has ordered the following to be officially quoted:—

Westminster Electric Supply Corporation, Ltd.—39,964 ordinary shares of £5 each, fully paid (Nos. 310,001 to 350,054).

**Smithfield Markets Electric Supply Co., Ltd.**—Sir H. S. Leon, speaking at the annual meeting, said that the increase in total expenses in 1919 was £2,700, but the sale of current had produced £8,000 more. The use of electric heaters was becoming increasingly popular. The company was at present buying its current in bulk under an arrangement which provided that when the price of fuel exceeded a certain figure the charge per unit against them rose proportionately. They did not see any prospect of costs of production falling for some time to come, and until they did a reduction in rates was out of the question. They must therefore continue the cautious policy of building up the reserves.

**Commonwealth Edison Co.**—The report for 1919 states that the electric operating revenues were $30,366,426; expenses (including amortisation and depreciation, $2,880,254), $19,519,507; net electric operating revenues, $10,846,919; other charges, uncollectable operating revenues, $119,938; taxes, $2,355,000; municipal compensation, $895,193; leaving net operating income $7,476,787; other income, $619,802; gross income, $8,096,589; deductions from gross income, $950,213, leaving $7,146,376. Interest on funded debt took $2,299,236, leaving available $4,847,138. Dividends paid amounted to $3,942,340; balance carried to surplus, $904,798.—*Financial Times.*

**Chelsea Electricity Supply Co., Ltd.**—Profit for 1919, £33,038, plus £1,106 brought forward, and £2,324 interest, making £36,467. Debenture interest £5,480; 6 per cent. preference dividend; reserve, renewals, and contingencies £16,688; written off cost of extinction of founders' shares £1,089; 4 per cent. on the ordinary shares for the year; carried forward £1,523; 5,593 new lamp connections (8 C.P.), making 345,527. Units sold 4,224,505, being 266,033 less than in 1918.

**Newcastle & District Electric Lighting Co., Ltd.**—Net profit for 1919, after charging interest on debenture, &c., and allowing £16,000 for depreciation, £8,494, plus £13,099 brought forward. Dividend 4 per cent., less tax; carried forward £13,263. Capital expenditure during the year for buildings, plant, and mains, £19,001. A large number of applications has been received for energy for all purposes, and a rapid expansion of business is expected.

**British Insulated & Helsby Cables, Ltd.**—Final dividend of 8¾ per cent., making 12½ per cent. for the year, plus a bonus of 2½ per cent. To reserve and depreciation £105,000; carried forward £103,000.

**General Electric Co., Ltd.**—It is announced that the issue of preference and ordinary shares was over-subscribed, and the list closed on Tuesday.

**Northampton Electric Light & Power Co., Ltd.**—At the annual meeting Ald. F. H. Thornton said the year had been interesting and critical. Never before had there been such fluctuations in the demand for current. Early in the year the whole of the power used for munition work was disconnected, and there was a substantial drop in the output. In March came an unexpected call to supply current for a portion of the Corporation tramway system. This partly helped to make up for the decrease in output, but it was succeeded by a reduction in the hours of employment in the factories of the town, with the result that the output continued to be below the preceding year until the end of October, when, with the removal of the lighting restrictions and what appeared to be steadier demands for industrial power, the weekly output began to exceed that of the previous year. This was further helped by the demand at the end of the year to supply the whole of the current for the Corporation tramways. The five years' contract for this supply commenced on March 1st, 1920. In April, 1919, the company purchased the Wellingborough Electric Supply Co., not merely with the view of rejuvenating a moribund undertaking, but also as a part of a much wider scheme for supplying current for rapidly increasing industries on that side of the county. Unfortunately, the County Council decided to impose such conditions as to make it impossible for the company to proceed, but the matter was still under consideration. It was hoped that something would be done with the help of the Electricity Commissioners. They had made a profit of £300 on the Wellingborough undertaking instead of the loss of £600 in the previous year.

**County of London Electric Supply Co., Ltd.**—Capital expended during 1919 £130,043. Total available revenue £232,989, including £15,516 brought forward. Deduct debenture and loan interest £44,177; written off preliminary expenses £5,000; to reserve for depreciation, &c., £50,000; to general reserve £45,000. Preference dividend 6 per cent., less tax, for the year; ordinary dividend 8 per cent., less tax, for the year. Carried forward £19,188. The report states that the Electricity Supply Act as passed should be of material assistance in connection with the electricity supply industry of the country, and should assist in solving the question of London electric supply. Mr. C. P. Sparks resigned the position of engineer-in-chief at the end of 1919. Mr. A. R. Bacon has been appointed chief station engineer and Mr. J. D. Dallas, chief mains engineer. Applications received during the year 8,532 KW., making the total 82,224 KW. Units sold 42,487,672, an increase of 2,161,409. Consumers increased from 28,400 to 31,390. The Coatbridge and Airdrie Electric Supply Co., Ltd., showed a decreased output during 1919 owing to falling off in war demands. This is temporary, and the load is rapidly overtaking the previous demands.

**Prospectuses.**—*The Fife Tramway, Light & Power Co., Ltd.*, are issuing 200,000 ordinary shares of £1 each at par to be applied in payment of loans in connection with the extensions and additions to the generating station, cables, and plant.

*W. G. C. Haywood & Co., Ltd.*—Applications are being invited until to-day for an issue of 160,000 10 per cent. participating shares of 10s. each at par. The company was registered in 1916 with £5,000 capital to carry on general engineering work (its address is Beaufort Works, Twickenham), and during the war was engaged on the production of aeroplane parts. The nominal capital is now £120,000, the business having been converted into a public company with the object of turning its organisation and equipment to account, for the provision of motor scooters, cycle cars, "Blue Bird" steam turbine fans and power plants (this is an Austrian design purchased with the business of Michael Pal and Co., Ltd.), the E.C. electric iron (which is being manufactured for Sumner Vaughan & Co., who have received orders *and inquiries* for over 150,000, on which a net profit of £18,750 to this company is estimated), and the "Feyens" engine. In the prospectus as printed in the daily Press, there is no information given as to the purchase price, and the profit figures are estimates on business booked or inquired for. The plant, premises, stock, &c., at Twickenham are valued at £30,470.

**Rushden & District Electric Supply Co., Ltd.**—At the annual meeting Ald. F. H. Thornton said that the reduction in the price of crude petroleum resulted in a saving of over £500 in the cost of fuel, notwithstanding a slightly increased output. An additional generating set was being installed to cope with the more urgent demand for power pending the completion of arrangements for bulk supply from Northampton.

**Telegraph Construction & Maintenance Co., Ltd.**—Net profit of £124,184 for 1919, plus £110,296 brought forward. Further dividend 7½ per cent., free of tax; to reserve fund £20,000, and £10,000 to pension fund; £114,840 carried forward.

**Metropolitan-Vickers Electrical Co., Ltd.**—The directors recommend a dividend on the ordinary shares at the rate of 8 per cent. per annum to December, 1919.

**Mirrlees Watson Co., Ltd.**—Dividend of 10 per cent. and a bonus of 7½ per cent. for 1919.

## STOCKS AND SHARES.

Tuesday Evening.

The extraordinary flood of new issues is one of the principal causes which tend to check business in existing securities, and to render the investor delicate in his choice of purchases. The fear of the Budget appears to have been fairly well discounted, and whatever may be announced, the Stock Exchange is prepared for it—up to a point. Confidence shows a little disposition to return, as improvement in the War Loan indicates. In regard to the new issues, each week brings more tempting offers than the previous one, and it is noticeable that even in such cases as those where a heavy over-subscription is secured, this does not necessarily imply a premium after allotment. In fact, the reverse has been the case in several instances lately, showing, of course, that the stag is extremely busy in this particular branch of Stock Exchange transactions at present. The prudent man is therefore rather inclined to wait until after allotment before venturing into new companies.

The eighth ordinary general meeting of the Automatic Telephone Manufacturing Co. is called for next Tuesday, March 16th, at Liverpool, and is likely to be of a lively character. The report shows a profit for last year of £15,723, and after necessary deductions, there remains £9,341 to go forward. The decrease in the profits is stated to be due to several causes, the most important of which were completely beyond the control of the company, and the directors felt that advantage should be taken—we quote the report—of "a very important and favourable offer" to exchange shares on the terms set forth in the circular issued to the shareholders a month ago. We venture to think that the board will be told very plainly at the meeting that proprietors are by no means unanimous in thinking that the offer was "very important and favourable," and that they, the shareholders, will demand to know why the opportunity was not afforded them for discussing the whole affair in general meeting. The price of the shares remains about 20s.

The Eastern Extension, Telegraph and Westerns are all ex rights, but no dealings have yet taken place in the new issues, as it is understood that the letters of allotment will not be out for a few days. The stocks and shares were quoted ex rights on the closing of the companies' books. Prices keep very hard, and the only noticeable feature in cable shares is the substantial fall which has taken place in most of the dollar securities, owing, of course, to the upward movement of the American exchange brought about by the forthcoming repayment by this country to the United States of part of its war debt. The full recovery in exchange was not held, but prices are considerably lower than they were a week ago.

Rights on Eastern ordinary stock are valued about 18, on Globes and Eastern Extensions at 45s., and on Western Telegraphs at 65s. Deductions of these amounts have given the various securities a cheap appearance, on the 10 per cent. dividend basis.

General Electric ordinary have gone back to 1 15-16 ex rights, and the preference to 18s. 6d., owing to the evident desire on the part of holders to apply for as many as possible of the new shares in order to provide the funds, they have been selling their existing shares. The rights are quoted 4s. 9d.-5s. 9d. premium over the issue price of 28s. Siemens at 30s. and Crompton's at 22s. are both 6d. lower. British Aluminium ordinary have further risen to 2 3-16, on the announcement regarding the new shares that are to be given, for nothing, to the proprietors. This came as a pleasant surprise. Although something of the kind had been expected, the terms are more generous than many looked for. Callender's are ¼ lower at 9½, apparently in sympathy with the dulness in Telegraph Constructions. In the engineering group, Babcock & Wilcox shed ½, and on the whole the iron and steel shares are a trifle down. With so much competition from the new issues, it is a little surprising that prices of the existing stocks and shares should hold their ground as well as they are doing, and the fact that there has been comparatively little fall in the latter argues the public's capacity for investment on a large scale, Budget or no Budget. Greenwood & Batley are £3 up at 13½, on the scheme of capital rearrangement just proposed.

The principal improvement in the electricity list has been secured by Brompton ordinary, which have risen 10s. to 6½. For this the advance of 50 per cent. in the dividend is, of course, responsible. Charing Cross at 3½ are another ½ higher, demand being stimulated in their case by the excellent yield obtainable at the current price, a consideration which applies also to St. James' and Pall Mall, causing in their case a rise of 5s. to 6½. Westminsters are also better at 5½. With such shares paying about 9 per cent. on the money, it only needs a little appreciation on the part of the public for further improvements to occur, but the market is always a quiet one, therefore receiving little advertisement from financial guides. London Electrics receded to 25s.

Metropolitans at 22 are a little better. Undergrounds keep heavy as a whole. Underground Income Bonds have gone back to 72, no interest being taken in the stock, while the

labour conferences this week have not tended to encourage purchases of Home Railway issues. Attention is being called to the recent speeches of railway chairmen in which references have been made to the position of the companies. At the recent meetings of proprietors of the Great Western and North-Western companies, the chairmen, Lord Churchill and Sir Gilbert Claughton respectively, spoke with unwonted hopefulness of their expectations in regard to the possible Government action. London Electric £10 shares have eased off to 2¾, at which the yield on the money comes to about 6¼ per cent. In our tables, we give the return on Underground Electric Income Bonds as £5 11s. per cent., free of tax, calculating the dividend for 1919 as 4 per cent.

Calcutta Trams are lower at 8s. 8d. Bombay Trams maintain their extraordinary prices. The British Columbia group continues to shrink. Mexicans are flat again, it being reported that General Villa is once more in active brigandage. A rise of 2 points in Brazilian Tractions will not surprise those who took notice of the well-informed buying mentioned here as being in progress last month. London and Suburban Traction 4 per cent. debenture is down 3 at 46½.

Marconis enlivened the market with a jump of 7s. 6d. to 4 3-16. Buying apparently drew stimulus from the announcement as to a possible telephone service between this country and New York. Concurrently, Anglo-American Telegraphs gave way rather sharply, for the same reason. Dealings in American Marconis cease this week, and will re-start in April in American Radio shares. Canadian Marconis have further stiffened to 14s. bid.

Rubber shares are in a lack-lustre condition, and the raw material gives no immediate indication of that rapid rise prophesied for it by those who are optimistic concerning substantial orders for the produce at an early date by Germany.

## SHARE LIST OF ELECTRICAL COMPANIES.

| | Dividend 1918. | Dividend 1919. | Price March 9, 1920. | Rise or fall. | Yield p.c. |
|---|---|---|---|---|---|
| **Home Electricity Companies.** | | | | | |
| Brompton Ordinary | 8 | 12 | 62 | + ½ | £8 16 10 |
| Charing Cross Ordinary | 4 | 7 | 84 | + ½ | 9 0 8 |
| do. do. do 4½ Pref. | 4½ | 4½ | 92 | — | 8 8 8 |
| Chelsea | 3 | 4 | 82 | — | 6 3 1 |
| City of London | 8 | 10 | 14 | — | 7 2 10 |
| do. do. 6 per cent. Pref. | 6 | 6 | 92 | — | 6 4 8 |
| County of London | 7 | 8 | 92 | — | 8 2 2 |
| do do. 6 per cent. Pref. | 6 | 6 | 9 | — | 6 13 4 |
| Kensington Ordinary | 6 | 7 | 52 | — | 6 13 4 |
| London Electric | Nil | 2½ | 1½ | +1/8 | 5 19 9 |
| do. do. 6 per cent. Pref. | 6 | 6 | 84 | — | 8 11 6 |
| Metropolitan | 5 | 6 | 82 | — | 7 14 10 |
| do. 4½ per cent. Pref. | 4½ | 4½ | 92 | — | 7 16 6 |
| St. James' and Pall Mall | 10 | 12 | 62 | + ½ | 8 16 10 |
| South London | 5 | 6 | 92 | — | 7 12 8 |
| South Metropolitan Pref. | 7 | 7 | 19/6xd | — | 7 3 7 |
| Westminster Ordinary | 8 | 10 | 52 | + ½ | 8 10 6 |
| **Telegraphs and Telephones.** | | | | | |
| Anglo-Am. Tel. Pref. | 6 | 6 | 80½ | —1 | 6 14 1 |
| do. Def. | 83/8 | 1½ | 19 | —2 | 7 18 0 |
| Chile Telephone | 5 | 6 | 84 | — | *4 13 2 |
| Cuba Sub. Ord. | 7 | 7 | 10½ | — | *6 13 4 |
| Eastern Extension | 8 | 10 | 16½ | — | *6 1 3 |
| Eastern Tel. Ord. | 8 | 10 | 167/8 | — | *5 19 5 |
| Globe Tel. and T. Ord. | 8 | 10 | 16½ | — | *6 1 3 |
| do. do. Pref. | 6 | 6 | 92 | — | 6 3 1 |
| Great Northern Tel. | 22 | — | 24 | — | 9 3 4 |
| Indo-European | 13 | — | 48½ | — | 6 13 4 |
| Marconi | 25 | — | 4 3/16 | + ¾ | 5 19 4 |
| Oriental Telephone Ord. | 10 | — | 2 7/16 | — | 4 16 0 |
| United R. Plate Tel. | 8 | — | 8 | — | *5 0 3 |
| West India and Panama | 1/8 | — | 1 1/16 | — 1/16 | 5 19 0 |
| Western Telegraph | 8 | 10 | 17xd | — | *5 17 8 |
| **Home Rails.** | | | | | |
| Central London Ord. Assented | 4 | 4 | 47½ | — | 8 8 6 |
| Metropolitan | 1 | 1½ | 22xd | + ½ | 5 13 8 |
| do. District | Nil | Nil | 18 | — | Nil |
| Underground Electric Ordinary | Nil | Nil | 3⅜ | + ⅛ | Nil |
| do. do. "A" | Nil | Nil | 6/6 | — | Nil |
| do. do. Income | 5 | 4 | 7xd | —1 | 5 10 0 |
| **Foreign Trams.** | | | | | |
| Anglo-Arg. Trams. First Pref. | Nil | Nil | 32 | — | — |
| do. do. 2nd Pref. | — | — | 5⅛ | — | — |
| do. do. 5 Deb. | 5 | 5 | 68⅛ | — | 7 15 0 |
| Brazil Tractions | — | — | 55 | +2 | — |
| Bombay Electric Pref. | 6 | 6 | 182 | — | 3 4 0 |
| British Columbia Elec. Ry. Pfce. | 5 | 5 | 61½ | —1 | 8 2 8 |
| do. do. Preferrred | 2½ | 5 | 52½ | —1 | 9 10 6 |
| do. do. Deferred | Nil | 3 | 43½ | —2 | 6 18 0 |
| do. do. Deb. | 4½ | 4½ | 60½ | —1 | 7 0 6 |
| Mexico Trams 5 per cent. Bonds | Nil | Nil | 38½ | +1 | Nil |
| do. 6 per cent. Bonds | Nil | Nil | 29½ | — | Nil |
| Mexican Light Common | Nil | Nil | 17½ | —5 | Nil |
| do. Pref. | Nil | Nil | 30½ | —2 | Nil |
| do. 1st Bonds | Nil | Nil | 51½ | —1 | — |
| **Manufacturing Companies.** | | | | | |
| Babcock & Wilcox | 15 | — | 3½ | — ½ | *4 5 9 |
| British Aluminium Ord. | 10 | — | 2 7/16 | + 1/16 | 4 11 4 |
| British Insulated Ord. | 12½ | 15 | 2 7/16 | — | 7 5 3 |
| Callenders | 25 | — | 9½ | — ½ | 6 17 0 |
| ,, 6½ Pref. | 5½ | 6½ | 42 | — | 6 16 10 |
| Castner-Kellner | 20 | — | 4 | — | — |
| Crompton Ord. | 10 | — | 29/- | — 6d. | 9 1 10 |
| Edison-Swan, "A" | 10 | — | 1½ | — | 8 0 0 |
| do. do. 5 per cent. Deb. | 5 | 5 | 79½ | — | 6 5 9 |
| Electric Construction | 10 | — | 1½ | — | 8 0 0 |
| Gen. Elec. Pref. | 6¼ | 6½ | 18/6 | — 1/- | 7 0 6 |
| do. Ord. | 10 | — | 1 1/16xd | — ½ | *5 3 0 |
| Henley | 25 | — | 2½ | — | 6 0 0 |
| do. 4½ Pref. | 4½ | 4½ | 8½ | — | 6 4 2 |
| India-Rubber | 10 | — | 16 | — | *6 5 0 |
| Met.-Vickers Pref. | — | 8 | 3 7/16 | — 1/16 | 5 6 8 |
| Siemens Ord. | 10 | 10 | 20/- | — 6d. | *6 13 4 |
| Telegraph Con. | 20 | 20 | 28 | — | *4 5 0 |

* Dividends paid free of Income Tax.

## MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

### Tuesday, March 9th.

| CHEMICALS, &c. | | Latest Price. | Fortnight's Inc. or Dec. |
|---|---|---|---|
| a Acid, Oxalic | per lb. | 1/5 | ... |
| a Ammoniac Sal | per ton | £95 | ... |
| a Ammonia, Muriate (large crystal) | ,, | £75 | ... |
| a Bisulphide of Carbon | ,, | ... | ... |
| a Borax | ,, | £42 | ... |
| a Copper Sulphate | ,, | £52 | £1 inc. |
| a Potash, Chlorate | per lb. | 11d. | ... |
| a ,, Perchlorate | ,, | 1/8 | ... |
| a Shellac | per cwt. | £42 | £2 dec. |
| a Sulphate of Magnesia | per ton | £15 | ... |
| a Sulphur, Sublimed Flowers | ,, | £28 | ... |
| a ,, Lump | ,, | £25 | ... |
| a Soda, Chlorate | per lb. | 6d. | ... |
| a ,, Crystals | per ton | 170/- | ... |
| a Sodium Bichromate, casks | per lb. | ... | ... |
| **METALS, &c.** | | | |
| g Babbitt's Metal Ingots | per ton | £118 to £345 | ... |
| c Brass (rolled metal 2" to 12" basis) | per lb. | 1/4 | ... |
| c ,, Tubes (solid drawn) | ,, | 1/6½ to 1/6¾ | 1d. dec. |
| c ,, Wire, basis | ,, | 1/4¾ | ... |
| c Copper Tubes (solid drawn) | ,, | 1/9½ | ¾d. dec. |
| g ,, Bars (best selected) | per ton | £168 | £5 dec. |
| g ,, Sheet | ,, | £168 | £5 dec. |
| g ,, Rod | ,, | £168 | £5 dec. |
| d ,, (Electrolytic) Bars | ,, | £124 | £6 dec. |
| d ,, ,, Sheets | ,, | £156 | ... |
| d ,, ,, Wire Rods | ,, | £139 | £6 dec. |
| d ,, ,, H.C. Wire | per lb. | 1/5½ | ¾d. dec. |
| f Ebonite Rod | ,, | 3/- | ... |
| f ,, Sheet | ,, | 2/6 | ... |
| n German Silver Wire | ,, | 3/- | ... |
| h Gutta-percha, fine | ,, | 13/- | ... |
| h India-rubber, Para fine | ,, | 2/7 | ... |
| i Iron Pig (Cleveland Warrants) | per ton | Nom. | ... |
| l ,, Wire, galv. No. 8, P.O. qual. | ,, | £57 | £4 10/- inc. |
| g Lead, English Pig | ,, | £53 10/- | 15/- dec. |
| g Mercury | per bot. | £24 10/- to £25 | ... |
| e Mica (in original cases) small | per lb. | 6d. to 4/6 | ... |
| e ,, ,, ,, medium | ,, | 5/- to 10/- | ... |
| e ,, ,, ,, large | ,, | 12/6 to 25/- & up | ... |
| g Phosphor Bronze, plain castings | ,, | 1/8 to 2/- | ... |
| g ,, ,, rolled bars and rods | ,, | 2/2 to 2/6 | ... |
| g ,, ,, rolled strip & sheet | ,, | 2/3 to 2/9 | ... |
| d Silicium Bronze Wire | per lb. | 1/11½ | ... |
| r Steel, Magnet, in bars | ,, | 1/8 | ... |
| g Tin, Block (English) | per ton | £369 to £370 | £14 dec. |
| n ,, Wire, Nos. 1 to 16 | per lb. | 5/5 | ... |
| White Anti-friction Metals | per ton | £90 to £345 | ... |

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

**Electrically-propelled Ships.** — The Winton Engine Works, of Cleveland, Ohio, which have attained considerable success with their four-cycle Diesel engines, have decided, says the *Motor Ship and Motor Boat*, to concentrate upon 500-B.H.P. sets direct-coupled to electric generators, and to employ them with a system of electric transmission in ordinary cargo vessels, up to 10,000 or 12,000 tons. The engine-room plant is to consist of multiple sets furnishing power at high speeds, and driving electric propelling motors at very low speeds. By placing a number of sets in the ship, immunity from breakdown can be guaranteed. Moreover, the cylinder sizes are small, the engines are easy to handle and are quickly repaired, and the general source of supply is not affected should a breakdown occur to one engine. The propelling motor, or motors, can have a speed variation of from 0 to 65 R.P.M., which is ideal for merchant vessels. The Winton Engine Works are now undertaking a number of installations of this type.

**The Channel Tunnel.**—Speaking at a meeting of the Anglo-French Society, on March 6th, Baron Emile B. d'Erlanger said that now the League of Nations had been formed, it was most desirable that a Channel Tunnel company should be registered under its ægis, such a company to hold all the share capital and debentures of the English and French companies, and to nominate a number of members on the directorates of these. The majority of directors would be elected under the auspices of the two Governments. Sir Arthur Fell, M.P., said that in two or three weeks' time the decision of the British Government would be made known, and he had not the slightest doubt as to the ultimate construction of the Tunnel.

**The E.T.U. and Plumbers.**—The Secretary of the Blackburn branch of the Electrical Trades Union has informed the Electricity Committee that cable jointers who are members of the Union have received instructions not to connect up to the mains any installation erected by a plumber or a non-Unionist. The Committee has referred the matter to the Divisional Whitley Council for consideration.

# Exports and Imports of Electrical Goods during October, November, and December, 1919.

The official returns of our foreign electrical trade for the last quarter of 1919 shows very satisfactory totals, the export values of electrical material for October, November, and December being £812,257, £906,035, and £849,149 respectively, a total of £2,567,441, as compared with £727,041 for July, £872,649 for August, and £652,857 for September, a total of £2,252,547, an increase of £314,000 for the quarter. The totals for the December quarter give a monthly average of, roughly, £855,000, as compared with an average of £750,000 for the preceding quarter, the monthly average of electrical exports for the 12 months of 1919 working out at £636,000, and the aggregate for the year being £7,635,001.

The principal increases in export values for the past quarter occurred in electrical goods, £180,000; insulated wire, £123,000; batteries, £25,000; telegraph and telephone material, £41,000; a falling off taking place in electrical machinery, £40,000, and meters, £20,000.

The electrical imports for the last three months of 1919 totalled £641,583, as compared with £428,563 for the September quarter, an increase of about £210,000, the figures being:—October, £220,222; November, £90,374; and December, £330,987; and July, £152,091; August, £116,656; September, £159,756. The increased values are:—In electrical machinery, £100,000; telegraph and telephone material, £110,000. The electrical imports for the 12 months amounted to £2,066,784, a monthly average of about £172,000.

The re-exports of foreign and Colonial electrical material for the three months under review totalled £30,183, the figures being for October, £9,685; November, £7,733; and December, £12,765; as compared with July, £14,456; August, £9,871; September, £10,221. The total value of the electrical re-exports for the year was £129,215, a monthly average of nearly £11,000.

Below are given comparative figures of the values of electrical exports for 1913, the year previous to the war, and for 1919.

TABLE I.—Electrical Exports for 1913 and 1919 Compared.

| | 1913. | 1919. | *Inc. or dec.* |
|---|---|---|---|
| Electrical goods ... ... | £696,607 | £1,332,432 | + £635,825 |
| Insulated wire ... ... | 967,746 | 1,906,660 | + 938,914 |
| Glow lamps ... ... | 153,865 | 150,357 | − 3,508 |
| Arc lamps and parts ... | 62,889 | 18,176 | − 44,713 |
| Batteries ... ... ... | 221,865 | 435,357 | + 213,492 |
| Meters ... ... ... | 172,767 | 239,794 | + 67,027 |
| Machinery ... ... | 2,209,724 | 1,975,194 | − 234,530 |
| Carbons ... ... ... | 20,772 | 13,194 | − 7,578 |
| Teleg. & telep. material... | 3,062,320 | 1,563,837 | − 1,498,483 |
| Totals ... ... | £7,568,555 | £7,635,001 | + £66,416 |

TABLE II.—Values of Electrical Exports and Imports. Last Quarter of 1919.

| | October. | | | November. | | | December. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Exports. £ | Imports. £ | Re-exports. £ | Exports. £ | Imports. £ | Re-exports. £ | Exports. £ | Imports. £ | Re-exports. £ |
| Electrical goods ... ... | 182,844 | 45,689 | 3,668 | 163,831 | 27,061 | 2,833 | 144,718 | 50,848 | 5,983 |
| Insulated wire ... ... | 197,610 | 2,941 | 1,479 | 240,981 | 3,291 | — | 235,454 | 5,638 | — |
| Glow lamps ... ... | 15,038 | 51 | 550 | 12,745 | — | 114 | 10,557 | 98 | 189 |
| Arc lamps and parts ... | 1,124 | 8,124 | — | 1,495 | 1,265 | 472 | 803 | 4,748 | 584 |
| Batteries ... ... ... | 28,480 | 5,141 | 39 | 53,210 | 1,481 | 8 | 28,052 | 5,084 | — |
| Meters ... ... ... | 21,013 | 3,406 | 648 | 18,656 | 3,561 | 344 | 22,211 | 3,744 | 489 |
| Machinery... ... ... | 233,781 | 138,641 | 2,168 | 224,980 | 40,707 | 3,292 | 222,036 | 189,255 | 972 |
| Carbons ... ... ... | 2,588 | 1,233 | 151 | 2,765 | 434 | — | 996 | 3,053 | — |
| Teleg. and telep. material | 138,779 | 149,996 | 982 | 187,392 | 12,574 | 670 | 184,322 | 68,519 | 4,548 |
| Totals ... ... | £812,257 | £320,222 | £9,685 | £906,035 | £90,374 | £7,733 | £849,149 | £330,987 | £12,765 |

# THE BRITISH INDUSTRIES FAIR.

(*Concluded from page* 316.)

## BIRMINGHAM.

The Midland Electric Manufacturing Co., Ltd., Birmingham.—In display arrangement this stand exemplified the company's policy in the manufacture of ironclad switch and fuse gear, "simplicity with efficiency"; all its products were mounted in the working switchboard manner, and good use was made of the space of the exhibit. The specimens were well designed, well finished, and included not only the final product as sent out, but separate component parts, special features and elements of M.E.M. switch and fuse gear, with sectional specimens of the many parts and details that go to the making of the complete article. A complete selection of the firm's specialities were staged, including switches, fuses, fuseboards, fuse elements, and accessories, from a study of which it was seen that the safety aspect was fully covered from the point of view of the regulations laid down by the responsible authorities. Illustrated herewith is a leading M.E.M. line, the "Kantark" ironclad fuse, fig. 4, as incorporated in the "Paragon" combined switch and fuse. The merits of both these lines are well known; in the fuse the arcing chamber is of adequate capacity, amply ventilated at the sides and lined with a non-arcing absorbent material which prevents firing. A wide range of patterns and capacities was shown, and in every case where porcelain is used this is of British manufacture.

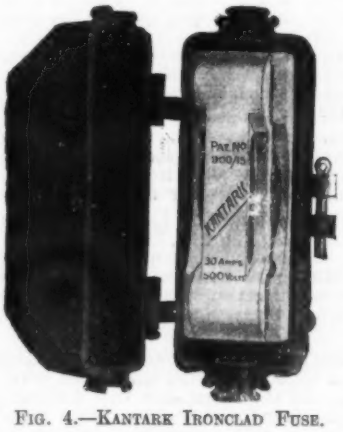


Fig. 4.—Kantark Ironclad Fuse.

Fig. 5.—Orbit Electric Fire. Fig. 6.—Brazier Pattern Fire.

The Falkirk Iron Co., Ltd., Falkirk.—The representative exhibit of the firm's domestic heating and cooking devices included the well-known electric cooking ranges and heating apparatus. The "Orbit" electric fire, fig. 5, is a stove of large heating capacity and chaste design; it is of elliptical shape on plan, and the finish at the back as well as at the

front lends itself to being placed in the centre of a room. Roller castors are concealed in the lion paw feet to facilitate removal, but when the fire is supplied for ship work fixing clamps are provided for screwing down to the floor. The extreme height is 30 in., breadth 27 in., and depth 16 in. A humidifier consisting of a water pan is fitted underneath the dome, access being obtained by lifting off the dome cover. An induced draught convector effect is obtained by the sliding air ventilator in front. The heating elements are made easy of access and arranged for heat regulation by switches mounted in the housing of the fire; all connections are made and carried to main terminals with an earthing terminal. The brazier pattern of fire, fig. 6, is constructed of cast iron with an ornamental brass frieze and solid brass pillars and feet; its overall size is 16 by 18 in. diameter, and its weight is 30 lb. The heating elements are of the red-hot radiant type, mounted upon a framing with an aluminium reflector, all concealed under the pierced dome cover. Two heat-regulating switches are mounted in the frieze. An enhanced glowing effect may be obtained by the addition of an amber-coloured lamp concealed in the base of the fire, which throws a glow on the floor covering; a separate switch is provided for this lamp so that it may be used independently of the heating element.

Messrs. Robinson & Hands Electrical Co., Ltd., Birmingham, exhibited four main lines, namely, lampholders in variety, 5 and 10-amp. capacity tumbler switches, lighting and power fuseboards, and accumulator switchboards. The latter consisted of an enamelled slate panel on which were mounted a voltmeter and two 6-in. dial ammeters of the dead beat gravity type; a 2-way D.P. voltmeter switch; a charge and discharge switch; two D.P. knife switches; four S.P. porcelain fuses; and an automatic cut-in and cut-out switch for charging the battery. The boards are supplied complete with all connections and sweating sockets, all terminals being plainly labelled. The 5-amp. lighting and 10, 25, 50, and 100-amp. power fuseboards were all of the shock-proof design, the former being in hardwood and the latter in steel-clad cases.

Messrs. J. A. Crabtree & Co., Ltd., Walsall, showed their tumbler switches of a quick make and quick break pattern, and kindred accessories of various types to meet general requirements for electric lighting, heating, cooking, motor car ignition, &c. These switches have a positive action, the insulation is of mica, and the contacts are of copper; they are made watertight in cast-iron cases.

Messrs. Quead, Ltd., London, exhibited a selection of their well-known electric fires and heaters. They were also showing a table cooker combination, electric flat irons, soldering irons, fans, &c., the stand and exhibits being very similar to that seen at the recent exhibition at Olympia.

The Benjamin Electric, Ltd., London, exhibited industrial lighting fittings. Shop window fittings and reflectors as well as street lighting lanterns, vapour and gas-proof fittings, hand lamps, &c., were on view besides electric battery horns for motor cars.

Messrs. W. Canning & Co., Birmingham, had on view a selection of apparatus for electroplating, cleaning, and drying out in revolving and other barrels, including plating dynamos and chemicals, also polishing and grinding apparatus.

Messrs. Premier Electric Heaters, Ltd., Birmingham, showed a selection of domestic heating and cooking devices, some of which were seen in operation, such as kettles, radiators of various types and sizes, irons, hot plates, &c.

The Sun Electrical Co., Ltd., London.—This exhibit comprised a number of electric fires with robust elements, as recently described in our pages. Also standard and protected types of switchgear and fuseboards in iron and wood cases; reflectors for industrial lighting, electric signs and flashers, "Lesco" lampholders, and "Xcel" irons and heating apparatus. The "Kalkos" system of conduit wiring was also to be seen on this stand.

Messrs. Litholite Insulators, Ltd., London, exhibited moulded electrical insulators and insulating material for all purposes, including terminal blocks, bushes, and bush spindles, terminal caps, lamp holders and adaptors, &c.

Messrs. Donovan & Co., Birmingham, showed ironclad power and lighting distribution boards, switches, and wall plugs, besides motor regulators and starters, and a number of electrical accessories, such as conduit, insulators, and domestic appliances.

The General Electric Co., Ltd., Birmingham.—On this stand were seen lighting fittings, lamps, and accessories; switchgear, flexible wire and cable, accumulators, medical apparatus, cooking and heating, as well as ventilating apparatus and electric measuring instruments.

The Edison Swan Electric Co., Ltd., Ponders End, Middlesex.—This stand comprised a large selection of the firm's manufactures, including heating and cooking apparatus, switchgear, and complete boards for country house lighting, wire, cable, and conduit, electric indicating and house service meters, and many other devices. An electrically-driven vacuum cleaner shown on this stand differed from the usual type inasmuch as the switch was incorporated in the handle. The latter is in a vertical position when the machine is not in use, but when pulled forward starts the motor or stops it when returned to the vertical position.

Messrs. Player & Mitchell, Ltd., Birmingham, had on view ships', yacht, river, and motor boat fittings, lamps, and navigation lights; also railway lamps, tramcar and railway brass work, &c.

Messrs. F. & C. Osler, Ltd., Birmingham, had a noteworthy stand showing electric lighting fittings in wrought and cast metals, as well as in cut glass. The firm specialises in the reproduction of historic models from the originals in the various museums, and many beautiful examples were exhibited.

The Tok Manufacturing Co., Ltd., London, exhibited rotary snap switches with capacities of from 500 to 5,000 watts, in single and double-pole, 2 and 4-way, 2 and 3-circuit, and series-parallel types. A heavy duty type suitable for heating and cooking or medical purposes was on view, as well as a lighter type as commonly used on the Continent instead of tumbler switches.

The Jackson Electric Stove Co., Ltd., London, showed various cooking and heating apparatus, including water heaters and radiators, also apparatus for medical, dental, and industrial uses. The firm manufactures cooking outfits up to any size for ships, restaurants, &c., as well as for private house use.

Messrs. Venner Time Switches, Ltd., London.—On this stand several time and other automatic switches for controlling electrical circuits were seen in operation. Demand limiters for the flat rate system of charging as used in housing schemes and switches for restricted-hour, 2-rate, Merz-demand, and other systems, were also on view.

The Improved Solidite Co., Ltd., Wandsworth, London, exhibited a cheap insulating material which can be moulded into any shape or form, and is made in nearly every colour. Metal fittings can be moulded into the article to be made, and the material is supplied in a number of grades and also in qualities suitable for machining.

The Semaphore Engineering Co., Ltd., Wandsworth, London, had on view dry batteries for all purposes, large and small, as well as complete electric lighting sets for use on motor cars and cycles.

The Frederick Crane Manufacturing Co., Ltd., Birmingham, exhibited celluloid lacquers and varnishes for all purposes, also coloured and frosting lacquers for lamps, &c.

The Damard Lacquer Co., Ltd., Birmingham, showed lacquers for general brass work, as well as "formite" and "bakelite" insulating materials for preparing moulded insulation, which is claimed to be acid resisting.

Messrs. Greenwood & Batley, Ltd., Leeds, exhibited "Bipol" accumulators, (as supplied to the Metropolitan Police) in which the paste is carried in wood frames, without lead grids, and the electrolyte is absorbed by glass wool; the complete battery is 25 per cent. lighter than the ordinary type.

Messrs. Wm. Goodyear & Sons, Ltd., Dudley, exhibited, amongst other things, the "Greenbat" electric industrial truck, which, as its name indicates, is manufactured throughout, including the motor, by Messrs. Greenwood & Batley. The motor is of the enclosed series-wound type, arranged for series-parallel control. The drive is by differential gear worm transmission shaft and universal coupling, all drives being taken by squares on the shafts. The battery is of the Chloride Ironclad Exide type. Every part of the truck is interchangeable; it will attain a speed of 5 M.P.H., three speeds in either direction being given. The pedal cut-out is interlocked with the controller, the latter must be brought to the neutral position to restart after once stopping, thus taking current through the resistance coils and starting on first speed again, which insures smooth running and avoids overloading the motor.

The British Ever-ready Co., Ltd., London, showed electric cycle lamps and motor car accessories, such as roof, hood, dashboard, and steering pillar lamps, switches, plugs, inspection lamps, ignition, and other batteries, &c.

The Western Electric Co., Ltd., Birmingham, representing British Electric Vehicles, Ltd., exhibited battery trucks for carrying half-ton and one-ton loads, also a battery locomotive for hauling 10 tons on rails. The exhibit also included intercommunication telephones from 2 to 25 lines, switchboards, and magneto and central battery telephone instruments.

Messrs. Industrial Appliances, Ltd., London, exhibited three types of battery industrial trucks, one having a capacity of 15-20 cwt., and the others each with a capacity of 2 tons, being box and drop-frame trucks. Three speeds are given in either direction with speeds ranging from 5 to 8 M.P.H. "Railodok" trucks are of all-British manufacture, and they are capable of hauling from 3 to 5 tons over and above the load according to the type.

Messrs. Alloy Welding Processes, Ltd., London, showed arc welding plant, using alternating current, in actual operation. The exhibit included samples of various types of electrodes and numerous sample welds and welded articles.

The Simoon Engineering Co., Ltd., London, showed D.C. motors and ironclad and switchboard type fuses. The motors

are manufactured in the open protected, semi, and totally-enclosed types, being either shunt, series, or compound wound. All parts are standardised and interchangeable; ball bearings are fitted. The coils are former wound, and the windings are of the barrel type. The copper commutator bars are mica insulated with micanite cone rings.

The Relay Automatic Telephone Co., Ltd., London.—On this stand, besides throat transmitters for use in noisy positions, the Marconi relay automatic telephone system was shown, which employs relays only, complicated electro-mechanical switching devices being unnecessary. It is claimed that the maximum movement in any part of the switchboard is only 1/32 in., resulting in a high degree of reliability.

Messrs. Attwater & Sons, Preston, exhibited mica for all electrical insulation purposes. The firm imports and cuts mica and makes micanite and bakelite in all forms, the latter especially for transformer oil switch gear.

Messrs. Electrical Conduits, Ltd., Walsall, showed tubes and fittings for the protection of electrical conductors in ships and buildings, including heavy gauge tubes with screwed ends and plain for grip or bored fittings, also junction and switch boxes, &c.

The London Electric Wire Co. & Smiths, Ltd., London.—On this stand a selection of the company's manufactures of wire and cable, insulated with different materials, as used in the manufacture of electrical apparatus of all kinds was to be seen.

Messrs. Vickers, Ltd., London, who had one of the largest stands, had a representative show of engineers' small tools, alloy steels, "Cosmos" electric lamps and case showing process of manufacture, various domestic heating and cooking devices, wires and cables, measuring instruments, rubber gloves, and rubber-proofed fabrics.

Messrs. May & Padmore, Ltd., Birmingham, had two stands on which, amongst other exhibits, were shown Bastian electric fires and heaters, irons, ovens, and electrically-heated water tanks.

Messrs. Edgar A. J. Hooper, Ltd., Birmingham, showed electric lighting fittings, comprising lanterns, brackets, single drop lights, pendants, standards, &c., a speciality being made of polished and satin brass, antique brass and copper, and oxidised silver finishes.

Messrs. Berry's Electric, Ltd., Birmingham, exhibited a number of the well-known "Magicoal" electric fires which were shown in operation.

Messrs. Watertight Fittings, Ltd., Chesterfield, exhibited a range of fittings and brackets in cast iron and brass for use with electric lamps; also conduit boxes and 5-amp. switches and fuses in cast-iron boxes.

The Electric Appliances Co., Ltd., Birmingham, showed "Imperial-Eureka" vacuum cleaners, including the electrically-operated model.

### LONDON.

Messrs. Siemens Brothers & Co., Ltd., Woolwich, showed a remarkable variety of primary cells, ranging from the Minotto type, once so familiar, to the most up-to-date pattern of improved Leclanché. Both wet and dry cells were shown, but the latter formed the great majority, including bell cells of various forms and sizes, medical cells, flash-lamp batteries of many different sizes and shapes, and the well-known "Inert" cells, which are particularly suitable for export, not being liable to deterioration in stock or in a tropical climate. We wede specially interested in the application of the "Inert" principle to refills for pocket lamps, a valuable innovation; it is not intended that these small cells should be charged by the ultimate buyer, who would probably bungle the job—they are to be filled by the retailer at the time of sale to the user. Thus the tradesman is protected against loss in storage, and the user gets what is in effect a brand new freshly-made battery, no matter how long it has left the maker's hands. Another interesting new type was the "G.R.3" ignition battery giving 4½ or 6 volts, which is intended mainly for a reserve or stand-by to the usual magneto ignition. Other exhibits were flash-lamp cases and materials of all sorts and sizes.

The Artistic Shade Co., London, had an exhibit of exceptional interest and attractiveness—one to which, we understand, the Queen gave special attention and commendation, and which the lay Press singled out for prominent notice. The company specialises in silk shades on wire frames, though parchment and linen are also used. The standards are in many cases of wood, turned and carved, and the shades are designed to match them. The shades are all made by hand to the designs of an artist, and many of them are hand-painted. For the convenience of customers the company's artists are available to prepare artistic colour schemes and design appropriate shades, bowls, &c. It is pleasing to add that the shades are moderate in price.

Messrs. James Pitkin & Co., Ltd., London, had an interesting exhibit, including the Holden electric chronograph for measuring the velocity of projectiles, of which a large number were made during the war; this instrument utilises the fall of a long rod under gravitation to give the time element, the distance traversed by the rod during the flight of the projectile between two screens being recorded on it, and accurately measured with a vernier device which is graduated in terms of velocity. The details of construction of the device are ingenious and interesting. An exhibit of wider industrial application was a new automatic coil winder; this machine is provided with automatic stop mechanism, length and convolution recording devices, and various adjustments to suit different sizes of bobbins, to control the tension of wire, &c. Samples of a new line of moving-coil measuring instruments, in which the operation of changing the range causes a corresponding number to appear on the dial, and many other instruments of non-electrical character, were shown.

The Vulco Manufacturing Co., London, showed samples of their accumulators, coils, battery boxes, and Ford parts, &c.

Messrs. Newton & Wright, Ltd., London, had a very good exhibit of standard X-ray and electromedical apparatus for hospitals, &c., including "Snook" transformer, induction coils, interrupters, and other apparatus for radiology, and electrotherapeutic apparatus. A novel feature was an X-ray apparatus for dental surgeons, having an oil-immersed transformer in the base with two secondary windings for the Coolidge tube, one to feed the filament and the other to generate the rays. The penetrative power of the rays was controlled by a small rheostat, in the filament circuit, and the tube, which was completely shielded with a lead-glass enclosure and a lead alloy funnel, was mounted on a parallel-motion frame and provided with a stereoscopic movement, as well as vertical and angular adjustments. The apparatus was designed to work off the public supply mains, the tube taking 5 milliamperes with an equivalent gap of 5 inches. The latest radiographic screen with convenient adjustments was shown; the tube was mounted in a lead-covered box, covered with lead-rubber, and the fluorscopic screen, carried by an integral aluminium casting, with suitable adjustments, was surrounded with an ample protective apron of lead-rubber.

Messrs. Henry G. Richardson & Sons and Messrs. Thos. Webb & Sons, Ltd., of Stourbridge, showed glassware for electric fittings. These and other firms testified to the extraordinary demand for such goods which prevails at present.

## ELECTRIC POWER SUPPLY IN THE RHINE VALLEY.

The following is an abstract of the lecture by Lieut.-Col. F. C. Aldous and Mr. A. E. L. Scanes, delivered at the North-Western Centre of the Institution of Electrical Engineers on February 10th, and at the Liverpool Sub-Centre on February 16th.

Electrical power supply in the Rhinelands has been developed to a very high degree, which is immediately made evident by the extensive use of overhead transmission lines, and by the installation of electric light and power even in small villages.

An attempt is made in this paper to give an idea of the general development during the last three years.

The power supply in the whole of the Rhine Valley, from Essen to Ahrweiler, is in the hands of one company, the Rheinisch Westfalisches Electricitatswerk, Essen (the R.W.E.) This is a private company, about a third of the shares being held by the Communes which receive light and power.

The R.W.E. is sub-divided into subsidiary companies, but while these are administered independently, the generating stations are all interlinked, and the feeders are carefully laid out so as to form a series of ring mains. The connections between the different stations are made partly by underground cables, but in most new work by overhead lines. All power is generated at the same periodicity, *i.e.*, 50 periods.

The Communes have a union in order to treat with the R.W.E. with regard to prices, and have also representatives on the board of the R.W.E.

Power is in general transmitted at 25,000 volts, 3-phase, and is transformed in the company's sub-stations to 5,000 volts, at which voltage it is distributed to consumers.

Besides the anthracite in the Essen district there is an area west of Cologne where there are large beds of lignite, close to the surface, and in seams of great thickness. The possibility of the conversion of this fuel into electric power had been proved as a commercial proposition, and it was, therefore, decided to erect a station of large size employing nothing but large units. The objects were, first, to transmit power to the Essen district and to reinforce the stations in that area; it was also proposed ultimately to transmit power much further north, for which reason a 100,000-volt transmission line was constructed to Osterath and Reisholz. Secondly, to develop electrical power supply in the southern area. This is being done by feeding into the old system by 25,000-volt underground mains, also by overhead transmission designed for 100,000 volts.

A large generating station known as Goldenbergwerk was begun in the year 1911, and at the outbreak of war there was one set in operation, a 15,000-kw. turbo-generator. The fuel burned in this station is lignite, obtained from an open

mine, close to the station. The mean thickness of the coal seam is 40 yards, and it is excavated by means of bucket machines, each driven by a 90-KW. motor. An electrically driven conveyor brings the trucks, of ¼-ton capacity, under a hopper, and the coal is discharged into successive trucks. By other conveyors the trucks are brought to four crushing houses, where they are automatically tipped into bunkers, from which the coal descends by gravity to the crushers. The machines are capable of dealing with 3,000 trucks in an 8-hour shift. At this rate the station could take in 18,000 tons of coal a day, which is sufficient for a continuous output of 125,000 KW.

Owing to the low calorific value of lignite and the large quantity of water which it takes up, a very large amount of fuel has to be dealt with, probably four or five times the weight that would be burned in a station using hard coal.

The station is built principally of ferro-concrete, and is arranged for extension on the western side. Since, however, the original design of the station has been departed from, any great extension will lead to considerable difficulties with regard to the connection between the generators and the transmission lines. There are at present four boiler houses, each about 300 ft. long, in each of which ten boilers are installed. Whereas the original design with six 15,000-KW. sets allowed for two boiler houses on the south side, in the latter extension the turbines are fed with steam from both sides.

The water-tube boilers are of the Stirling type, of 8,300 sq. ft. heating surface, evaporating 46,000 lb. of water per hour mean, 70,000 lb. per hour maximum, specially designed for burning lignite. Each boiler has five furnaces, giving a total grate surface per boiler of 530 sq. ft. The fuel contains as much as 67 per cent. of water, and as it descends it is heated, and gas and steam are driven from it. The gas passes through holes and burns over the incandescent fuel, which lies on the fire bars to a depth of 6 to 10 in. If the fuel becomes too dry it is apt to burn back in the shoots. Green economisers of standard type are used. Both electrically and turbine-driven rotary boiler fuel pumps are installed.

Natural draught is provided by eight chimney stacks, 360 ft. high, giving a draught on the boilers of about 1 in. of water, the temperature of the furnace gases in the uptake being about 450 deg. F. Only about 2½ per cent. of ash remains, which is dealt with by a central vacuum plant.

Steam is delivered at a pressure of about 215 lb. superheated to about 660 deg. F., to a 16-in. main, whence it is fed to the turbines. The engine room, about 500 ft. long, is equipped with 70-ton electric cranes for the small sets, and 120-ton cranes for the large ones. The turbines are seven in number, five of 15,000 KW. and two of 50,000 KW.

The 50,000-KW. turbine runs at 1,000 R.P.M., and is designed with one velocity wheel having two rows of blades, and nine Rateau wheels. The turbine weighs 250 tons, of which the rotor alone weighs 49 tons. The generator scales 225 tons and the generator rotor 106 tons. The turbine wheels vary in mean diameter from 134 to 150 in., which gives a mean velocity of 590 to 725 ft. per second. The design is very similar to the A.E.G. 15,000-KW. sets.

Owing to the war, the manufacturers were compelled to make the disks and blades of carbon steel, both on the 50,000-KW. sets and also on some of the 15,000-KW. sets, but it is understood that up to the present they have suffered no trouble from corrosion or erosion.

The consumption, about 12.5 lb./KW., is of course not good, owing to the low vacuum obtained, and the area of the exhaust branches is considerably less than is allowed for the 18,750-KW. sets now being installed at Glasgow by the Metropolitan-Vickers Electrical Co.

The air filters are enclosed in separate ferro-concrete buildings, each unit having a capacity of 30,000 KW.

The generators, with direct-coupled exciters are arranged with partly radial and partly axial ventilation, with a fan at one end. In case of fire in a generator, it is quickly extinguished by means of a hose pipe and compressed $CO_2$.

In the 50,000-KW. set the condensers are of the surface type placed with their axes parallel to the axis of the turbine, and each has a surface of about 34,000 sq. ft. In order to obtain a proper distribution of steam to the surface of the tubes, the shells are filled not more than two-thirds up, and very large gaps are left between the banks of tubes to allow the steam to pass well into the centre. This design would appear to be very extravagant in material, owing to the low tube plate efficiency. It is far better practice to reduce the diameter of the shell and carry the tubes nearly to the top, at the same time putting an ample steam dome at the inlet to distribute the steam. The tubes are about 1 in. bore.

Following the usual Continental practice there is no water box on either end of the condenser, and as these are two-flow, all the pipe connections are made on one cover; should it be necessary to remove this, the pipework must be dismantled.

It is general practice throughout the station, with the exception of the 50,000-KW. sets, to have one motor-driven and one turbine-driven set of pumps. The turbine-driven sets are direct-coupled without the use of gears.

There are two sets of turbine-driven pumps to each main turbine. The sets run at 1,000 R.P.M., direct coupled to circulating air and extraction pumps, the rating being 1,000 B.H.P. per set, giving a total of 2,000 B.H.P. for 50,000 KW. Any of the four auxiliary sets serving the two main units can be used on any of the four condensers. The circulating pumps in the same manner are connected to a common bus-pipe running under both condensers.

Cooling towers are used, and as the water is very hard, about 15 degrees, the whole of the make-up water is passed through a battery of 12 Permutit water softeners.

The loss of vacuum on the condensing plant was very serious due to the rapid deposit of lime, and at the end of six months, it was impossible to introduce a finger into the tubes. With the present Permutit system it is possible to run for three years without cleaning a condenser. The greatest care is taken throughout the station to keep the feed water from contact with the air, and provision is made for removing all $CO_2$ from the water, it being the impression in Germany that most corrosion of boilers is due to $CO_2$ rather than to air.

In the part of the station occupied by the two 50,000-KW. sets the depth from the engine-room floor level to the basement level is nearly 33 ft. This involves very costly buildings. Under each of the 50,000-KW. generators there is a large chamber hollowed out, to which the air is admitted by means of a sliding door. The entrance to this chamber is by means of a double air-lock door. One side of the chamber is almost entirely occupied by the end of the surface condensers, which are hermetically sealed into the wall. It is thus possible to clean and withdraw the tubes in what is substantially the air duct of the plant.

The two chief reasons for placing the Goldenbergwerk on its present site, which involves the use of cooling towers, rather than on the Rhine, were: the amount of coal used daily amounts to 7,000 tons at the present time, which will be increased as the station is extended; and the natural water in the Rhinelands is excessively hard, sufficiently so to substantially close up the tubes.

Each 15,000-KW. machine is directly connected to a 6,300/25,000-volt transformer, and synchronisation is done at 25,000 volts by electrically operated oil switches fitted with overload releases, each switch consisting of three separate single-phase switches, each in a fire-proof chamber. Automatic synchronising is not used. Bare copper conductors are used from generator to transformer and from transformer to switch. Emergency 6,000-volt conductors, or busbars, are installed by means of which any machine can be connected to any transformer.

The busbars are in duplicate and are normally worked on two separate sections, so that in case of a breakdown on the mains, only part of the station is affected. By means of selector switches, a machine can be thrown on to either set of busbars. About half the power from the station is distributed at 25,000 volts, the remainder at 100,000 volts. The whole of the 100,000-volt apparatus—busbars, switches, transformers, lightning arresters, &c.—is contained in a separate building.

The 100,000-volt transmission lines are interconnected at a point about 25 miles away, so that in the event of a breakdown on one line, power can be obtained by another route. Outgoing transmission lines are connected through air-break switches to lightning arresters of the horn type, connected to earth through water resistances, there being two separate resistances in series for each phase. In parallel with the lightning arresters are high-resistance choke coils connected to earth.

The 50,000-KW. sets are directly connected to A.E.G. transformers of 60,000 K.V.A., 6,300/110,000 volts, synchronisation in this case being done at 100,000 volts. From each transformer the high-pressure conductors are led by overhead wires to the transmission house, where they pass downwards through air-break switches to two 100,000-volt electrically-operated oil switches, fitted with overload and no-volt release. These switches have been successfully tested to break a load of 100,000 KW. The cumbrous nature of this switch is certainly an argument against the use of sets as large as 50,000 KW.

The overhead transmission lines are some of iron and some of aluminium, with a steel core .13 sq. in. cross section, and are carried on steel towers, with concrete foundations.

The insulators are porcelain and of the suspension type, and the line is typical of American practice. Where the lines leave the station the towers are about 130 ft. high, but the usual height is about 80 ft., and the span about 150 yards. Where a line crosses the Rhine, it is carried on towers 260 ft. high, the span being about 500 yards. The lines are taken across open country, which is largely agricultural, electrical power companies having special rights to demand wayleaves for power lines. These lines cross roads, electric railways, telegraph lines, &c., with no protective net.

In order to balance the phases, the wires are crossed over three times on each circuit.

Besides the motor and lighting load, there are important electrical furnaces supplied by this station, including about 10,000 KW. in the neighbourhood of the station, and 8,000 KW. at Erftwerk for the manufacture of aluminium. As a result the power factor of the station is kept fairly high, about 0.8, and no special arrangements to improve this are made. The load factor of the station is between 0.6 and 0.7. There are in the Reisholz area large electrically driven rolling mills.

For lower voltages, 5,000 and under, though a large amount of cable work is used, wherever possible wires are run overhead, especially on new work. A usual practice is to run overhead wires up to a village where the current is transformed

down to 220 volts, and distributed through the village. The low pressure wires are run on short tubular poles, which are carried on brackets on the houses. Lighting leads are then carried into a porcelain cap on the pole, down the tube, and through an insulator into the house.

Another lignite station of similar dimensions was built during the war at Zsabornewitz, near Bitterfeld, where eight 22,500-K.V.A. turbo-generators are installed. Power is generated at 6,600 volts, and is transmitted at 110,000 volts, a distance of 132 km., to Berlin, and at 82,500 volts to important nitrate factories.

The Troisdorf factory is owned by the Rheinisch-Westfaelische Sprengstoff-Actien-Gesellschaft, and at the end of the war it was manufacturing about 80 tons of guncotton and about 40 tons of smokeless powder per day, also detonators, celluloid, &c. All the power used here is electric; steam plant is used only for heating and drying, the electric power being taken from the mains of the R.W.E. The consumption in 1918 is said to have been 40 million units. The factory receives power by two 25,000-volt 0.08 sq. in., 3-core cables at the main sub-station; distribution is effected at 5,000 volts, and at 220 volts for lighting.

The motors in this factory, 800 in all, from 300 to 70 H.P., are wound for 5,200 volts, and below this size for 220 volts. They are built in general for medium speeds and for belt drive. The average power factor of the system under normal working is about 0.7.

The Cologne-Bonn railway is supplied from its own power station, and operates at 1,000 volts D.C. A standard train consists of two motor cars and two trailers. Each motor car has two 130-H.P. motors, and the maximum speed is 45 M.P.H. Current is collected from a double trolley wire by two pantograph bows on each motor car. On entering the town area, the train operates on the town circuit of 600 volts D.C. Westinghouse air brakes are installed.

The Sieglar sub-station of the Sieglar-Zündorf light railway is operated entirely by mercury vapour converters, the original motor-generators being kept as a standby. The three mercury converters were built by the Gleichrichter A.G. Glarus, Zürich, each for 200 KW., 6-phase, 800 volts D.C. They occupy less floor space than motor-generators or rotaries, and the first cost is said to be less. Similar converters are built by Brown, Boveri up to a size of 500 KW.

### Discussion at Manchester.

The Chairman (Mr. J. A. Robertson) remarked that the lecturers did not seem to be overflowing with admiration for everything they had seen, and Mr. Scanes had been severely critical with regard to some points. It was not usual for a discussion to take place on a lecture such as this, but the members might like to ask questions in order to get further information on matters that had been touched upon.

Mr. G. Sills said in 1914 he saw some big 100,000 volt switches in Berlin which had buffer resistances inserted in the bottom of the tanks. Had buffer resistances been introduced into the 100,000 volt switches to which Col. Aldous referred?

Mr. J. Drummond Paton said he had been in the district and had seen the brown coal made into briquettes under pressures of 10,000 to 12,000 tons. In that form there was no need to use such a large quantity as Col. Aldous stated in order to secure the desired thermal efficiency. He thought that there was probably a lack of briquetting material, and the lignite was, therefore, used in a crude semi-dry state. An interesting point was the extent to which the administration was determined by the influence of the communes. He had earnestly advocated with regard to the proposed super stations that the representatives who were to administer the electricity supply should be chosen from the people.

Mr. Ellis, criticising the diagram of a station which had been shown, said it appeared to him the lay-out was absolutely spoiled by jamming together two 50,000 KW. generators on opposite sides of the engine room. To his mind it completely spoiled the extension of the station in the future.

Col. Aldous, in replying, said he was not able to get a photograph of the 100,000-volt switches. There were three tanks, one for each phase, each tank being about 5 ft. broad, 6 ft. high, and 9 or 10 ft. long. The current was broken at four points in series, and between the two middle points there was a buffer resistance. All three tanks were quite close together, so that a breakdown might have disastrous results. He noticed that on the smaller switches each phase was in a separate compartment. The lignite was used not in briquettes but in the crude form. That was the reason why the calorific value was so low. Measured in pounds of steam per pound of fuel it was from 1.5 to 1.8, whereas when the lignite was compressed into briquettes it was about 5.5. They seemed to get on very well with the crude lignite, and he rather doubted whether it would pay to install plant to compress the fuel into briquettes.

With regard to Mr. Ellis's criticism, the diagram might be mistaken in showing the two 50,000-KW. generators so close together, but it was a fact that in the position shown it completely altered the lay-out of the station, and it would have to be considered when the time came to extend. The only way of getting power out was by overhead transmission. He supposed the transformers were built up on site. Some of the 60,000 K.V.A. transformers were built by the A.E.G. and others by Siemens.

Mr. S. L. Pearce, in moving a vote of thanks to the lecturers, said he believed a good deal of the capital of the Rhenish Westphalian Company was held by the municipalities, but that the operations were entirely carried out by the company's staff. It was well known that the Electricity Supply Act of 1919 made provision for the inclusion of the consumers to take a share in the administration of the district authority. He agreed with the criticism of the lay-out of the station with the two 60,000-K.V.A. generators, but in all fairness it should be remembered that obviously the station had been extended beyond the limits for which it was originally designed. That was the case to-day with a good many stations in this country. The ratio of heating surface to grate area seemed to be abnormally low. Doubtless it was occasioned by the quality of the fuel which was being used. The same observation applied to the cooling surface in the condenser. The switchgear lay-out, as it appeared on the screen, was certainly exceedingly complicated. That arose from the fact that two secondary distribution pressures were employed, one at 25,000 and one at 100,000. The step-up transformer and the generator should be treated as one unit, and there should be one step-up pressure only if it could possibly be arranged. He still remained unconvinced as to the merits of overhead lines.

### Discussion at Liverpool.

Dr. E. W. Marchant (chairman) said the paper gave a remarkably complete description of the new power stations which the Germans had succeeded in putting up during the war. They would like to have some more information, especially with regard to the mercury converters.

Mr. H. Dickinson said he had been in the district in June, 1914, and was told that coal could be delivered to the boilers at 1s. 3d. per ton. The Power Co. had a 50 years' contract. The 50,000-KW. machine was not as difficult a proposition, considering the speed, and the vacuum, as some that were now being undertaken in this country, for instance, the 2,000-KW. set for the new station on the Wear, which was running at 2,400 R.P.M. with a vacuum of 29¼ in., whereas the 50,000-KW. set was only running at 1,000 R.P.M.

Mr. T. D. Clothier said the proposition clearly was to utilise an almost unlimited supply of fuel in the form of soft coal—fine stuff to work with in one respect, as there was only 2½ per cent. of ashes, compared with 35 to 40 per cent. of ashes here. The distribution from these large power stations required most careful consideration. The difficulties of transmission in this country were more important than the difficulty of getting coal and water. If the use of mercury converters proved a sound proposition it would raise the question whether the present tendency to turn over from D.C. to A.C. low-pressure distribution was necessary and proper.

Mr. Ohlson said the Germans in this instance had erected their station on the coal fields, whereas in this country stations were placed in the middle of the consumers, and coal and water were brought to them. For the conditions prevailing in this country the latter course was the most suitable.

Mr. W. Lang said the location of the stations always cropped up. He was of opinion that they could leave out the cable question altogether, and go on with the station. The cable makers would always be ready to fill in any gaps.

Mr. S. E. Povey asked a number of questions, and on the subject of burns-out of large generators, said the use of an automatic switch to break the excitation current and kill the exciter field was to be recommended as likely to minimise the risk of the insulation of the generator catching fire. The switch should operate automatically after the main oil switch had been operated, and not be left to an attendant.

Mr. A. E. L. Scanes, in the course of his reply, said the calorific value of brown coal varied from 3,000 to 3,400 B.TH.U. per lb. The exhaust steam from the auxiliaries could be partly used either in the main turbines or diverted to the condensers. Owing to the inefficiency of the small turbines, it was probable that there would be too much steam for the whole of it to be used for feed heating. Referring to the question of wages, at the present time when the men asked for a rise they might get a reasonable one. If, on the other hand, they did not think it was reasonable, the military governor appointed a referee, and both the masters and the men had to appear before him. As the referee was entirely unprejudiced, his decision was usually accepted. In any case there was no appeal, and the referee's decision was enforced.

Lieut.-Col. Aldous said that no definite figures were available as to the cost and efficiency of mercury converters, but these were believed to compare favourably with the rotary converter. He had no definite figures as to the price of coal, but the price had gone up as well as everything else, and if they had a contract for 50 years, this contract must have been revised. He believed all the stations in the Essen district were linked up, some with 25,000-volt lines, and others with 100,000 volts. The power used on one section of busbars would appear to be from 30,000 to 50,000 KW. They did not appear to use reactances in the generating circuits. He thought they had no special system of protection for generators or for feeders, but relied on the overload release, with time limit on the oil switches, and this country was very much ahead of them in this respect. Horn type lightning arresters were used almost throughout.

# NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

*Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.*

## A Marconi Wireless Telephone Cabinet.

The accompanying illustration, fig. 1, shows the new Marconi ½-kw. wireless telephone and telegraph cabinet, which was briefly mentioned in our last issue in connection with the British Industries Fair; it measures about 4 ft. high by 2 ft. deep and 4 ft. wide, and is supplied with power at 85 volts, 150 cycles, by a rotary converter or motor generator. The minimum daylight range for telephony is 100 nautical miles; for telegraphy by "tonic train" (interrupted continuous wave)

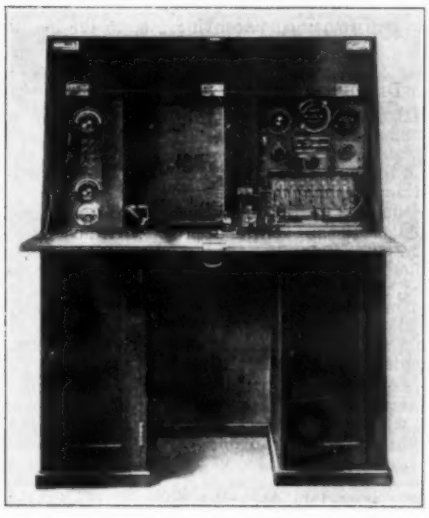

Fig. 1.—Marconi ½-kw. Cabinet.

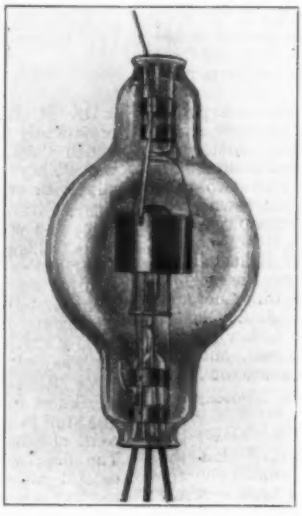

Fig. 2.—Transmitting Valve.

the range is 130 n.m., and for telegraphy by uninterrupted c.w., 300 n.m., with aerials at least 100 ft. high and 220 ft. long. The source of high-frequency energy for transmission is a Marconi patent three-electrode valve (fig. 2), which is maintained in oscillation by a reaction coupling; for telephony a similar valve is used to control the amplitude of the oscillations, and by switching over from the microphone to a buzzer and key the change to "tonic train" telegraphy is made. The high pressure for the anodes of the valves is provided by a step-up transformer through a two-electrode rectifying valve,

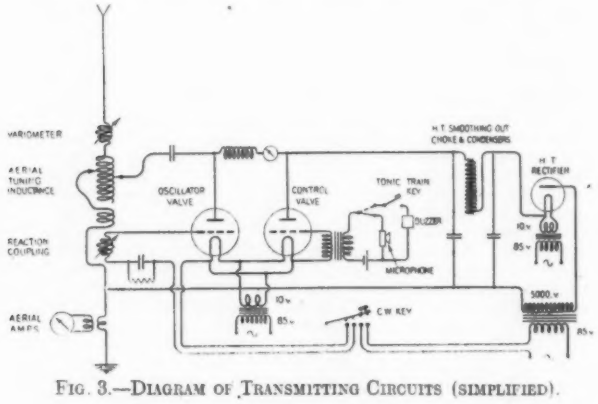


Fig. 3.—Diagram of Transmitting Circuits (simplified).

in circuit with smoothing-out choking coils and condensers, and a step-down transformer with two secondaries supplies current to the filaments of all three valves. The receiver is provided with a standard Marconi seven-valve amplifying detector, and the change-over from transmitting to receiving is effected by the movement of a single multiple-contact switch. It will be observed that the whole of the work is done with valves, and that no discharger is required. The apparatus is made by Messrs. Marconi's Wireless Telegraph Co., Ltd., of Marconi House, Strand, London, W.C. 2.

## Inspection Tube Fittings.

Messrs. Isaac Griffiths & Sons, Imperial Tube Works, Friar Street, Wednesbury, have recently introduced a labour-saving invention in the form of inspection tube fittings (fig. 4). These fittings are designed to take the place of "draw-in" boxes in conduit work, and consist of tubes possessing outlets twice the length of the opening in the boxes. As the overall diameter of these tubes is only slightly greater than

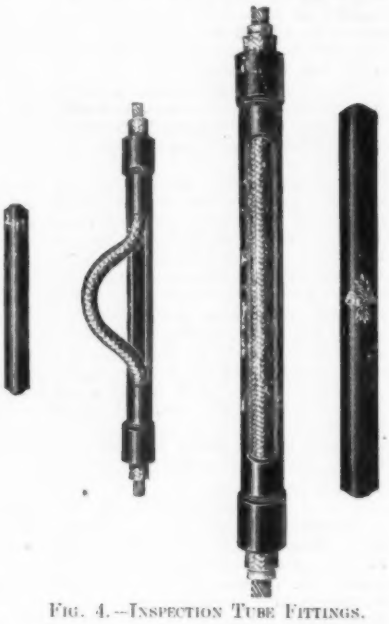

Fig. 4.—Inspection Tube Fittings.

that of the conduit, less space is taken up, and the appearance of the system is greatly improved. The sizes of these fittings range from ¾ in. diameter to 2 in.

## A New Electric Bed Warmer and Food Warmer.

Mr. Leoline Edwards, 81, St. Margaret's Road, Twickenham, is the manufacturer of a simple but effective device for

Fig. 5.—Foot Warmer Adapted to Food Warming.

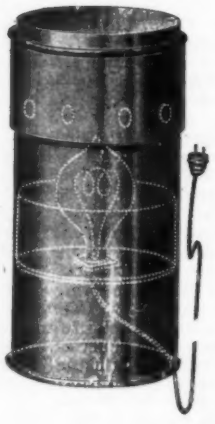

Fig. 6.—Foot Warmer.

warming a bed. As will be seen from fig. 6, the device consists of a metal cylinder closed at one end. Within this case is a sleeve which can be moved up or down, and to this is

fixed a 2½-c.p. carbon lamp, together with a length of flex and an adapter. The mouth is closed by a metal cover. The cylinder is covered with flannel.

This warmer can be adapted to food warming (fig. 5), and will also serve as a night light when the flannel cover is removed, the cylinder being perforated at the middle. Food may be kept at a temperature of 100 deg. F. for any period by means of this device, the cover being in the form of a small pan with handles.

A series of readings taken by means of a thermometer in bed showed that a temperature of 114 deg. F. was reached in half an hour. After eight hours the reading was 220 deg. Water (1½ pints) was boiled and placed on the heater; the temperature after nine hours was 105 deg. F. Half a pint of cold water was brought to 115 deg. F. in eight hours.

## LEGAL.

### A Profiteering Inquiry.

The Complaints Tribunal of the Central Committee which was established to investigate charges of profiteering on the part of wholesale dealers, held a sitting at the Hotel Windsor, Victoria Street, S.W., on Thursday last week, under the presidency of Mr. W. Marshall Freeman, when a complaint was investigated which had been lodged by Messrs. H. Underwood & Co., of 37, Kilworth Avenue, Southend-on-Sea, regarding the price charged by Messrs. J. Sellar & Co., Ltd., of 1, Cheapside, London Road, Southend-on-Sea, for electrical slip conduit elbows. The complainants stated that the trade price charged by the respondents for elbows of ⅝ in., electric wiring conduits or tubing, of stamped metal, was 6s. a dozen. The same article it was said, could be purchased locally at Southend at 3s. 6d. a dozen, while a better elbow of solid metal had been bought from the Edison & Swan Electric Co. at 2s. 4d. a dozen.

Mr. Harold Underwood, who appeared for the complainants, said he made a purchase from the respondents of three ⅝-in. wire conduits on December 20th. He was charged 6d. each for the elbows, and complained that in any other shop in Southend he could buy the same article for 3s. 6d. a dozen. He had previously purchased the same article from the respondents at 6s. a dozen, and had complained to them of the price charged.

Asked whether he had the letter, Mr. Sellar, who appeared for the respondent company, said he never received it.

Mr. Underwood added that he never received any reply to his letter. He had purchased better articles from the Edison-Swan Co. at 2s. 4d. a dozen; the goods sold by them were of solid metal. He had also obtained a quotation from Messrs. Young & Martin, Ltd., dated February 9th, who asked 4s. a dozen.

The Chairman: The ones complained about are described as split elbows?

Mr. Underwood: Yes. He went on to say that the previous Wednesday he went to the General Electric Co., Ltd., who quoted him 15s a gross for the elbows, plus 50 per cent.

The Chairman: In other words, 22s. 6d. a gross, or 1s. 10½d. a dozen.

Mr. Underwood: Yes. He also produced a quotation from Electric Installations, who asked 3s. 3d. a dozen for stamped elbows with cast sleeves, and 3s. 9d. a dozen for malleable cast elbows.

The Chairman: What was the price of these things before the war?

Mr. Underwood: About 1s. a dozen. That, of course, was the trade price.

In answer to Mr. Sellar, it was stated by Mr. Underwood that he had done a good deal of business with the respondent company.

Mr. Sellar: Who paid the accounts?

Mr. Underwood: I did.

Was it your mother?—No; My father has paid accounts to you.

Have you ever paid us any money direct yourself?—Yes.

I think you pretty well know that we don't want your orders, as we don't assume that you are properly in the trade. Further, we don't consider three conduits a trade purchase, do we?—Yes.

Your mother has begged me not to have any dealings with you?—I have not heard of it.

The complainant said that before the war his mother was a bit scared about his being in business on his own account, owing to his age. He had not got a shop of his own—he could not get premises, and was carrying on the business from his private house.

Mr. W. Cuff, assistant manager in the conduit department of the General Electric Co., said that his firm manufactured and supplied elbows similar to those referred to.

The Chairman: What is the proper price?

Witness: The trade price for the stamped elbows is 15s. a gross, or 1s. 3d. a dozen, plus 50 per cent.

What about the solid elbows?—They are 2s. 9d. a dozen to-day, plus 75 per cent.

What was the price in November?—2s. 9d. a dozen, plus 33⅓ per cent.

What was the price of the stamped elbows in November?—It was the same.

Do you understand the trade custom regarding the supply of goods to gentlemen like the complainant?—We heard that he undertook jobs at houses. If he came to our counter and gave his card we should give him the trade terms, which would be the ones I have quoted to you.

Even if he only wanted a quarter of a dozen?—Yes.

The Witness went on to say that he agreed that a firm like the respondents reselling such goods should make a profit. The usual profit in the trade was 33⅓ per cent. on the cost price, or 25 per cent. on the selling price.

Mr. Sellar said that last year it was very difficult to get such goods, and he had messengers running about trying to get them.

Witness: You should have come to us.

Mr. Sellar, in putting the case for the respondent company, said that the business had been in existence for many years. He admitted the sale to the complainant at the price mentioned. He produced an invoice from the British Thomson-Houston Co., which showed that he purchased two gross of elbows at 40s. a gross, plus 20 per cent. Owing to the shortage last year in such goods, he had asked customers to let him have elbows, and had allowed them 4s. 6d. a dozen for such goods.

Questions were asked by the Chairman as to the extent of the respondent company's business, and Mr. Sellar said that during the war the turnover dropped to about £2,690. It had since increased, and last year amounted to something like £5 000. In the company's shop was a list which showed that ⅝-in. elbows were sold by them at 5s. a dozen.

The Chairman: Then why did you charge the complainant 6s. a dozen?

Mr. Sellar: I didn't want his custom.

You don't want the custom of a man who pays cash?—I charged him a penny extra for the three elbows.

The Chairman called attention to a letter which Mr. Sellar wrote to the Secretary of the Tribunal on February 18th, which stated "On two occasions he had asked for credit, and we have had to collect through our solicitors, and that is probably the bottom of the trouble."

The complainant declared that the statement was untrue, and the chairman said it was a serious matter.

Mr. Sellar further stated that he regarded the accused, not as a trade customer, but as a private buyer.

Mr. Geoffrey Green, of Leigh-on-Sea, spoke of the excellent reputation held by the respondent company. He had purchased elbows from the company at 5s. 6d. a dozen.

The Chairman: Did you think you were paying a good price?

Mr. Green: I could not get them elsewhere.

Mr. Sellar declared that there was no profit on the electrical branch of the company's business.

In giving the decision of the Tribunal, the Chairman said that the matter came before them as a wholesale transaction, which it was. The complainant had made out his case. By the custom of the trade, and the general practice adopted by the respondents, the complainant was given wholesale prices. The respondents put on 1s. a dozen, and therefore were guilty of profiteering, and had broken the law. The Tribunal considered that a reasonable and liberal price to have charged was 4s. a dozen. They, therefore, ordered a refund of one-third of the price charged. The chairman added that they did not consider that the case was of sufficient importance to justify any further action, but they hoped that the respondents would be more careful in future.

### The Lighting of Underley Hall.

An application was made to Mr. Justice Eve, in the Chancery Division, on March 4th, by the Duke of Portland and Mr. R. D. Upton, trustees of a deed of settlement made by the late Earl of Bective on the marriage of his daughter, the present Lady Olivia Cavendish-Bentinck, of Underley Hall, Kirkby Lonsdale, for an order to raise capital by the sale of land, subject to the trusts of the settlement for the purpose of installing a new system of electric lighting and electric bells at Underley Hall.

It was explained to his Lordship that the present installation was put in under an order, similar to that now asked for, made by Mr. Justice Kekewich in 1898, but the engineer was advised that it was not adequate, or even safe.

His Lordship said the trustees had the power to raise the necessary capital, and made the declaration asked for.

**Engines for Alcohol Fuel.**—Reminding us that many years ago it conducted extensive experiments with regard to alcohol fuel engines, the Parsons Motor Co., Ltd., Southampton, writes expressing disappointment that in spite of the reports of Committees on this subject, up to now the Government has done nothing at all, except to appoint an Alcohol Fuel Investigation Officer. Feeling, however, that something must be done soon, the company last year carried out further experiments on alcohol and alcohol-benzol mixtures, and is now executing orders for engines using these fuels for countries where there is already a supply of power alcohol available. Some of our own Colonies are using alcohol fuel extensively. Alcohol fuel can be used in the ordinary petrol engine with very little modification, and alcohol-benzol even more easily still, but to get power and consumption results comparable with the paraffin engine numerous details have to be altered and attended to; the company's tests show results which are entirely favourable to alcohol fuel when these points have been duly carried out. If the restrictions on its use in this country could be removed, says the Parsons Motor Co., private enterprise would soon find a way to place large quantities of home-produced fuel alcohol on the market, with advantage to everyone concerned, avoiding exporting capital, utilising shipping, and at the same time helping home industries in many directions.

## NEW PATENTS APPLIED FOR, 1920.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

5,340. Arc lamp electrodes for production of violet and ultra-violet light. B. M. Young and H. C. Ross. February 23rd.

5,360. Means for starting, lighting, ignition and warming motor-cars, motor-cycles, &c. R. H. Playfoot. February 24th.

5,364. Ignition devices for internal-combustion engines, &c. W. Pickard and D. R. Dobson. February 23rd.

5,381. Ignition sparking plugs. F. L. Rapson. February 23rd.

5,384. Arrangement for high-speed automatic printing telegraphy. M. D. Dimitrievitch. February 23rd.

5,388. Electrical, &c., signs. E. W. Chamberlain. February 23rd.

5,389. Thermal electrical switches. E. W. Chamberlain. February 23rd.

5,411. Device for preventing removal of lamps from holders. A. G. Cornwell. February 23rd.

5,423. Thermionic tubes for wireless transmission systems. S. Brydon, A. G. T. Cusins, S. Johnson, and J. H. Whittaker-Swinton. February 23rd.

5,424. Vacuum tubes, &c. S. Brydon, E. Cummings, and A. G. T. Cusins. February 23rd.

5,429. Device for replacing fuse wire and indicating blown-out electric circuits. P. Davies. February 23rd.

5,431. Circuit-breaker for electrically-heated utensil. E. C. R. Marks (Landers, Frary & Clark). February 23rd.

5,432. Electrically-heated utensil. E. C. R. Marks (Landers, Frary & Clark). February 23rd.

5,433. Electrically-heated device. Landers, Frary & Clark. February 23rd.

5,434. Electrically-heated device. Landers, Frary & Clark. February 23rd.

5,435. Controlling device. Landers, Frary & Clark. February 23rd.

5,437. Controlling device for electrically-heated utensils. Landers, Frary & Clark. February 23rd.

5,438. Electrically-heated utensil. Landers, Frary & Clark. February 23rd.

5,440. Contact devices. Siemens & Halske Akt. Ges. February 23rd.

5,442. Carbon brushes for dynamo-electric machines. W. W. Jarvis and Morgan Crucible Co. February 23rd.

5,467. Electric switches. S. Kobzy. February 23rd.

5,476. Means for securing incandescent electric lamps in holders. L. Myers and A. J. Nicolls. February 24th.

5,485. Electrical integrating meters. Electrical Apparatus Co. and A. J. Martin. February 24th.

5,496. Ignition devices for internal-combustion engines. D. R. Dobson and W. Pickard. February 24th.

5,534. Instrument for transmitting and receiving telephonic communications on aeroplanes, &c. Stols Electrophone Co. and W. A. Saxby. February 24th.

5,549. Process for electro-deposition of alloys of copper and zinc. S. O. Cowper-Coles. February 24th.

5,555. Operating tipping-gear upon vehicles electrically. E. H. Dine, P. F. Smith, F. R. Stocks. February 24th.

5,560. Ignition magnetos for internal-combustion engines. H. W. F. Ireland and H. Lucas. February 24th.

5,565. Spark plug cleaner. Champion Spark Plug Co. February 24th.

5,566. Electric foot rest and foot warmer. I. Panza and A. Zacchini. February 24th.

5,578. Field systems of dynamo-electric machines. G. Schroeder. February 24th.

5,585. Electric switches. Benjamin Electric Manufacturing Co. February 24th.

5,586. Circuit-closer. Benjamin Electric Manufacturing Co. February 24th.

5,609. Electrically controlled steering gear for ships. H. Morris-Airey, J. W. S. Dorling, W. P. Gandell and A. K. Macrorie. February 24th.

5,611. Electrical control apparatus for lighting systems. Igranic Electric Co. (Cutler Hammer Manufacturing Co.). February 25th.

5,619. Electric lamps. Efandem Co., A. H. Williams. February 25th.

5,643. Electric switches. R. W. Hills. February 25th.

5,650. Electric incandescent lamps for projection, &c. M. J. Mason. February 25th.

5,669. Sound-locating apparatus. British Thomson-Houston Co. (General Electric Co., U.S.A.). February 25th.

5,671. Thermo-cells for electrical measuring apparatus. Westinghouse Lamp Co. February 25th.

5,697. Wireless direction finders. H. J. Round. February 25th.

5,703. Process for production of metallic parts. S. O. Cowper-Coles. February 25th.

5,715. Multi-step amplifiers. M. I. Pupin. February 25th.

5,728. Receivers of high-frequency sound waves of electrical oscillations. M. I. Pupin. February 25th.

5,729. Adjustable setting lever for electric ignition devices. Bosch Akt. Ges. R. February 25th.

5,736. Apparatus for charging and discharging electric storage batteries. H. C. Hodges. February 25th.

5,737. Sound generators. M. I. Pupin. February 25th.

5,738. Automatic telephone exchange systems. Sterling Telephone and Electric Co. and W. C. Davey. February 25th.

5,740. Receivers for signalling by sound waves. M. I. Pupin. February 25th.

5,741. Device for automatically advancing ignition in internal-combustion engines. J. E. Tuscher. February 25th.

5,743. Electric toaster. E. P. Taylor. February 25th.

5,748. Brake mechanism for electrically propelled vehicles. P. A. H. Mossay, Mossay & Co., and Ransomes, Sims & Jeffries. February 25th.

5,749. Electric controllers for electrically propelled vehicles. P. A. H. Mossay, Mossay & Co., and Ransomes, Sims & Jeffries. February 25th.

5,763. High-tension battery. F. Richardson. February 26th.

5,774. Aerial systems for wireless telegraphy. C. T. Wilkinson. February 26th.

5,777. Suspension of electric light fittings. H. C. Busbridge. February 26th.

5,782. Automatic electric lighting system. T. Ferguson and J. R. Johnstone. February 26th.

5,785. Call indicators for telephone systems. Automatic Telephone Manufacturing Co. (Automatic Electric Co.). February 26th.

5,786. Railway signalling systems. Automatic Telephone Manufacturing Co. February 26th.

5,796. Selecting devices for automatic telephone systems. J. E. Collyer, E. A. Petithory, and Siemens Bros. & Co. February 26th.

5,802. Connection for permitting simultaneous use of several electrical burners for soldering or welding. H. Fritze. February 26th.

5,807. Electrical accumulators. C. Saunders and Saunders Electrical Co. February 26th.

5,813. Receivers for wireless telegraphy and telephony. E. Hoghton. February 26th.

5,816. Production of light electrically. Siemens & Halske Akt. Ges. February 26th.

5,845. Fuse and junction or terminal boxes for electric lighting installations. J. Stone & Co. and M. Walton. February 26th.

5,846. Circuit-breaker with automatic variation of ignition for internal-combustion engines. J. E. Tuscher. February 26th.

5,857. Testing armatures of electric machines. H. C. M. Patten. February 26th.

5,859. Electro-magnetic generators and motors. L. Robertson, R. Lacon, H. W. Lee, and Sir W. G. Armstrong, Whitworth & Co. February 26th.

5,868. Automatic telephone exchange system. Sterling Telephone & Electric Co. and W. C. Davey. February 26th.

5,869. Automatic telephone exchange system. Sterling Telephone & Electric Co. and W. C. Davey. February 26th.

5,890. Methods of transmitting power from windmill to dynamo, &c. A. L. Macnamara. February 27th.

5,895. Electric illuminating devices for theatrical stages, &c. T. H. Rochford. February 27th.

5,899. Electron tube apparatus. Westinghouse Lamp Co. February 27th.

5,904. Electric fuse boxes, switchgear, &c. F. W. Abbott. February 27th.

5,907. Device for attaching electric conducting wires to pipes, rods, &c. G. Turnock. February 27th.

5,909. Magneto to sparking plug switch with combination lock. J. W. Cliffe. February 27th.

5,916. Electric spark and plug tester. W. T. Bayley. February 27th.

5,925. Telephone systems. Automatic Telephone Manufacturing Co. February 27th.

5,942. Safety controlling-gear for electrically-propelled vehicles. R. Garrett & Sons and H. R. Simpson. February 27th.

5,945. Electric control of dynamo-electric machines driven by prime movers. British Thomson-Houston Co. and J. Hutt. February 27th.

5,949. Alternating-current electric instruments for indicating synchronism, power factor, phase difference, &c. C. L. Lipman and Nalder Bros. & Thompson. February 27th.

5,950. Glass vessels for incandescent lamps, &c., and method of producing them. H. G. C. Fairweather (Fabrique Suisse de Lampes à Incandescence).

5,951. Device for testing sparking plugs. C. C. H. Williams. February 27th.

5,978. Detector tubes. Westinghouse Lamp Co. February 27th.

5,987. Aerial masts for wireless telegraphy, &c. S. Moehl. February 27th.

5,988. Machines for generating electrical energy. K. F. Ries. February 27th.

5,989. Electrical apparatus. K. F. Ries. February 27th.

6,010. Magneto-electric machines. E. G. C. Barton and G. E. Barton. February 27th.

6,055. Electrically-driven blocks, hoists, &c. F. Ogden. February 28th.

6,056. Ignition devices for internal-combustion engines. J. Bossan. February 28th.

6,059. Cable gripping device. J. A. Hogan. February 28th.

6,060. Self-regulating constant-current variable-speed dynamo. J. A. Hogan. February 28th.

6,063. Electrical signalling apparatus for railways. J. Gardner. February 28th.

6,065. Lampholders and screw caps. N. Kilian. February 28th.

6,079. Wireless telephony. W. T. Ditcham. February 28th.

6,082. Electric switches. C. A. Damey and R. K. Damey. February 28th.

6,084. Brush holders for electrical machines. H. G. Andre. February 28th.

6,085. Electrical voltage regulators. H. G. Andre. February 28th.

6,086. Electrical regulators. H. G. Andre. February 28th.

6,087. Electro-magnets. H. G. Andre. February 28th.

6,090. Rotary electric hand drills. Siemens-Schuckertwerke. February 28th.

6,091. Heat-measuring appliance for electrical purposes. Siemens-Schuckertwerke. February 28th.

6,101. Apparatus for subjecting molecular matter, &c., to electrostatic stress of high-tension electric discharge. F. O. Niece and R. M. Legget. February 28th.

6,106. Printing telegraph systems. Western Electric Co. February 28th.

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**Electric Ploughing in Italy.**—In view of the necessity for improved methods of cultivation in Italy, considerable interest is being displayed in the possibility of utilising some system of electric ploughing on a large scale. In this connection trials were recently held in the vicinity of Rome of the apparatus designed and manufactured by Violati-Tescari Bros., at which the King of Italy, the Italian Minister of Agriculture, and other prominent officials were present. It is reported that the results of these trials were very satisfactory, a triple plough being employed in the first instance, which operated perfectly, and in the second place, a single plough, with which a depth of about 20 in. was reached in spite of the difficult character of the ground on which the trials were held. Conditions in Italy are very favourable to the adoption of electric ploughing. Not only is the necessary power available in almost every section of the country, but the fields are comparatively small, and in many instances level. It is claimed that by the Violati-Tescari system a hectare (2.471 acres) can be ploughed for about 80 lire (£3 4s. 4d.), including in this sum the increase which has already taken place in the wages of workmen, possibilities of further increases, interest on invested capital, amortisation, &c. The cost per hectare, using tractors or other mechanical means, is estimated at 300 lire (£12 1s. 3d.), owing principally to the extremely high price of the fuel. The Violati-Tescari system of electric ploughing is a comparatively simple one. At one corner of the field to be ploughed a powerful electric capstan or winding apparatus is established, from which wire cables are stretched entirely enclosing the field in question. At the two near corners these cables pass through pulleys which are securely anchored, while at the far corners they are connected with two movable anchor-wagons. Between these two, a duplex plough mounted on wheels is drawn backwards and forwards across the field by means of the cable, and each time a furrow is ploughed the anchor-wagons move up a sufficient distance to bring the plough into position for the next operation. The plough is provided with an equal number of shares on each side of the wheels, facing each other, so that no turning is necessary; when one side is working the shares on the other side are lifted clear of the ground. A seat is provided for the operator.—*U.S. Commerce Reports.*